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BRITISH MUSEUM
NATURAL HISTORY.

TUTE SI RECTE VIXERIS

PHILOSOPHICAL TRANSACTIONS:

Giving ſome

ACCOUNT

OF THE

Preſent *Undertakings*, *Studies* and *Labours*

OF THE

INGENIOUS;

In many

Conſiderable Parts of the WORLD.

VOL. XVII. For the Year 1693.

LONDON:
Printed for *S. Smith* and *B. Walford*, Printers to the *Royal Society*, at the *Prince's Arms*, in St. *Paul's* Church-yard. 1694.

BRITISH MUSEUM
NATURAL

To the HONOURABLE
Sir *ROBERT SOUTHWELL*, Kt.
PRESIDENT;
And to the
Council and Fellows
OF THE
Royal Society
OF
LONDON,
FOR THE
Advancement of *Natural Knowledge*,
This Seventeenth Volume
OF THE
PHILOSOPHICAL TRANSACTIONS
Is humbly Dedicated

By *Richard Waller*, S.R.Secr.

IMPRIMATUR,

Vol. XVII. Philoſoph. Tranſact.

Jan. 31. 169¾.

Rob. Southwell,
P. R. S.

BRITISH MUSEUM NATURAL HISTORY

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the *Royal Society*, at the Prince's Arms in St. *Paul's*
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Beginning the Eighteenth Volume.

PHILOSOPHICAL TRANSACTIONS.

For the Month of January, $169\frac{3}{4}$.

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I. *An Account of the Earthquakes in* Sicilia, *on the Ninth and Eleventh of* January, 169$\frac{2}{3}$. *Tranſlated from an* Italian *Letter wrote from* Sicily *by the Noble* Vincentius Bonajutus, *and Communicated to the* ROYAL SOCIETY *by the Learned* Marcellus Malpighius, *Phyſician to his preſent Holineſs.*

THE Great Secrets of Nature are ſo inſcrutable, that we find them far out of our reach whenever we go about to form a true and nice Judgment of them; nor is the Task leſs difficult to diſcover the Effects of Portentous Events, divers Accidents being often confounded with the Effects themſelves, and one Cauſe enchained with and depending on another. With theſe Difficulties I find my ſelf encompaſſed in this Relation which you have commanded from me of the Natural Events and Effects of the late Earthquake, of which there are ſome whereof we yet are in ſuſpenſe, whence they were cauſed, or whether they ſprung from a hidden Principle, or blind Chance. Theſe Doubts obliged me to relate all, and lay the whole before you, that your Prudent and Searching Judgment may chooſe out ſuch as may ſeem moſt likely to ſatisfie the Deſires of *Signior Marcello Malpighi*, and leave the reſt as only Niceties of leſs Value.

The continual Fiery Eruptions of *Ætna* (of which the firſt that we have any Account of, happened 500 Years before the Deſtruction of *Troy*, as *Diodorus Siculus* relates) have been taken for the moſt likely Cauſes of the horrible ſhakes that from time to time have laid waſte the Iſland of *Sicilia*, as is obſerved by *Fazello*, in the firſt Decade in the 1*ſt*. Book, *Cap*. 4. and in the 10*th*. Book of the laſt Decade. Where he remembers that of the Year 1542. which on the 10*th*. of *December* at the 23*d*. hour ſhook the whole Iſland, and eſpecially *Val di Noto*, *Syracuſa*, *Lentini*, *Sortini*, *Mililli*, *Catania*, *Agoſta*, *Noto*, *Caltagirone*, *Militello*; and in ſhort, the ſame Cities and Caſtles which were miſerably ruined by the two late violent Earthquakes of this preſent Year 1693.

The firſt of which was at Five a Clock the next Night after the 9*th*. of *January*. Its Motion was of that ſort which *Ariſtotle* and *Pliny* call the Firſt *Species*, and is by them likened to the ſhaking Fit of an Ague, cauſing ſuch a motion as ſhakes the Earth from ſide to ſide. In this firſt almoſt all the Edifices in the Country were thrown down, whereof ſome were very high, and ſtrong built Towers. A great part of the City of *Catania*, with many other was demoliſht, and a great many Buildings in *Val di Noto*. *Syracuſa* was alſo much ſhattered, but not ruined. This was not preceded by any darkneſs in the Air, but a pleaſing ſerene warm time, which was the more obſervable, as being unuſual at that time of the Year, yet it was not to any exceſs.

Some Perſons which the Evening before were Travelling in the Country, obſerved a great Flame or Light, at about an *Italian* Mile's diſtance, and ſo bright, that they took it for a real Fire made by ſome of the Country People; and though they went directly towards it, yet it ſeemed to keep at the ſame diſtance from them. Whilſt they were obſerving of this Appearance the Earthquake began, which was ſenſible even to the Horſes they rode upon, that were affrighted thereat, and the Trees were all ſhaken. Upon this the amazed Travellers looking for the Light they ſaw juſt before, found it quite vaniſht. We perceived, turning towards the Sea, that the Waves which before the ſhake only beat gently upon the Shoar, began now to make a dreadful noiſe. The next day, which was the 10*th.* the Night and Day following, the Air was overſhadowed with Darkneſs, and tinged with a deep yellow, and the obſcured Sun ſtruck our Minds with the Melancholy Preſage of the approaching Earthquake: Which was the Second, and happened on the 11*th.* of the ſame *January* about the 21*ſt.* hour, and laſted about Four Minutes. It was much like the ſecond ſort, which *Ariſtotle* and *Pliny* call a Pulſe or ſtroke, from its reſemblance to the beating of an Artery. And by *Poſſidonius* in *Seneca,* is repreſented by the Name of Vibrations,it being a Perpendicular lifting up of the Earth, as *Pontanus* deſcribes it,

Dubio nunc verbere ſubter
Quaſſari aut ſurſum ſublato pondere ferri.

So horrid and amazing a ſhake was at once over all *Sicily*, of which it left, if not deſtroyed, yet at leaſt every part miſerably ſhaken. Its impulſe was ſo vehement and powerful, that not only many Cities and Countries of the Kingdom of *Naples*, but the Iſland of *Malta* participated alſo of its fury. It was in this Country impoſſible to keep upon our Legs, or in one place on the dancing Earth; nay, thoſe that lay along on the Ground, were toſſed from ſide to ſide, as if on a rolling Billow.

In open places the Sea ſunk down conſiderably, and in the ſame proportion in the Ports and incloſed Bays, and the Water bubbled up all along the ſhore.

The Earth opened in ſeveral places in very long clefts, ſome an hands breadth, others half a Palm, others like great Gulfs. From thoſe openings that were in the Valleys, ſuch a quantity of Water ſprung forth as overflowed a great ſpace of Ground, which to thoſe that were near it, had a ſenſible Sulphureous ſmell, though in a low degree, and without that unpleaſant ſtifling produced by the ſmoak of Brimſtone.

In the Plain of *Catania*, an open place, it is reported, that from one of theſe Clefts, narrow, but very long, and about Four Miles off the Sea, the Water was thrown forth altogether as Salt as that of the Sea.

In the City of *Noto* is a Street of half a Mile long, built of Stone, which at preſent is ſetled into the Ground, and quite hanging on one ſide, like a Wall that inclines; and in another Street before the Aſſent *del Durbo*, is an Opening big enough to ſwallow a Man and Horſe.

Great Rocks were looſened and thrown down from the Mountains every where. And in the Country of *Sortino*, inhabited by about 5000 Perſons, a great number periſhed in the Houſes which were beaten down by them in their way, as they rolled down from the Hills.

This Accident had its Effect on the Earth it ſelf, for there happened to be a great Ciſtern, or Reſervatory of Water hollowed on the top of a Rock, which was looſened and thrown off from the reſt of the Rock, and ſlid down to the bed of the River that runs in the bottom, where the Ciſtern remains as it was full of the ſame Water it had received before the Earthquake.

A very great many Grotto's made by Art or Nature, are now fallen in.

In *Syracuſa* and other places near the Sea, the Water in many Wells, which at firſt were ſalt, are become freſh again, and have not as yet loſt their Goodneſs, ſo that they are ſtill fit to drink.

The Fountain *Arethuſa* for the ſpace of ſome Months was ſo brackiſh, that the *Syracuſans* could make no uſe of it, and now that it is grown ſweeter, its Spring is increaſed to near double.

In the City of *Termini* all the Running Waters are dryed up, and amongſt the reſt a ſmall River near to it, with which they watered their Gardens and Orchards. It was contrary with the hot Baths, which were augmented by a third part of what they were before the Earthquake.

In many plain and level places very high Walls leaped from their Foundations above two Paces, leaving that whole ſpace perfectly clear and free from Rubbiſh and Ruines, as if they had been taken up and carryed off. And in *Syracuſe* two Side-walls of a ſmall Houſe jump'd up from each other, the one upright, and ſtood upon its bottom at a great diſtance from its former place; and the other leaving its Companion, flew away ſo as to make an Angle with the other, to the wonder of the beholders of ſo extravagant an Accident.

Not far from the Country of *Caſſaro*, from the tops of two Mountains, between which through a long Valley ran a River, two very great Rocks were looſened, which tumbling down over againſt each other, met ſo exactly, as to cloſe up the Valley, and ſtop the Current of the River, which not finding any ſubterraneous or ſide-paſſage, has filled up the Valley to the top of the Rocks that were thrown down, and runs over them, forming a Lake three Miles round of a conſiderable depth.

In the Territory of *Sortini*, in a piece of Ground half a Mile long, but much narrower, the Ground at ſeveral little Interſtices is ſunk from the level, in ſome places two, in others three Palms, and ends in a very deep Circular Gulf or Swallow.

A Fountain in the very Minute of the Earthquake on the 11*th.* threw forth its Waters tinged of a Blood-red, which continued for three hours, and then it dryed up, leaving many holes in the Mud at the bottom, through which real Aſhes were thrown out, and the next day the Waters returned of the former quality, without the leaſt alteration.

In the City encompaſſed with Caves on three ſides, although by the conſiderable ſhakes that were given it, there was not much Ruines made, yet a very dreadful ſound and noiſe was heard for a great while.

The South Winds have blown very much, which ſtill have been impetuous in the moſt ſenſible Earthquakes, and the like has happened at other times.

From the 11*th.* of *January* to this 14*th.* of *September* there have been conſiderable and ſtrong South Winds, preceded by a noiſe like Cannon at a great diſtance, ſome of a longer, ſome a ſhorter continuance; this has been obſerved in all Parts, but louder in cavernous places, and in the Valleys between the Mountains, where the ſhakes were more violent, in proportion to the diſtance from the Sea.

Darkneſs and Obſcurity of the Air has always been over us, but ſtill inferiour to that on the 10*th.* and 11*th.* of *January*; and often theſe Clouds have been thin and light, and of a great extent, ſuch as Authors call *Raræ Nubeculæ.* The Sun often, and the Moon always obſcured at the Riſing and Setting; and the Horizon all day long dusky, ſo that our wonted Proſpects are ſhortned; but for ſome little time paſt it has grown ſomething clearer.

To the no ſmall trouble of the South Winds, has been joyned the unuſual Weather. The Heat indeed at the beginning of the Summer has not been extream, but the Sun entring *Virgo*, it grew very great, and at Noons intolerable.

Since

Since the firſt of *Auguſt*, which was a moſt Tempeſtuous Day, not only for the exceſſive Rains for about four hours, but for the Hail and very loud Thunder, the ſhakes of the Earthquake have been leſs ſenſible and ſeldomer, and for two Months not ſo Univerſal, but ſometimes in one place, ſometimes in another.

It has been obſerved, that in leſs ſolid Ground, ſuch as Chalk, Sand, or looſe Earth, the Miſchief was without compariſon greater than in Rocky places. And in *Syracuſa* the difference was viſible in three places; that is, in the middle of the City, in the little Iſland, and in *Zaracati*, where the Ancient *Syracuſa* ſtood; in all which places the Buildings being on a Rocky Foundation, remain for the moſt part untoucht, or only ſhaken, or at leaſt not quite demoliſht: Whereas on the contrary, in the reſt of that Territory which is not Rocky, a very great Number of Noble Structures and Towers lye like a horrid Deſart, and heap of vaſt Ruines.

The Effects it has had on Humane Bodies (although I do not believe they have all immediately been cauſed by the Earthquake) have (yet) been various; ſuch as *Fooliſhneſs*, but not to any great degree, *Madneſs*, *Dulneſs*, *Sottiſhneſs*, and *Stolidity* every where: *Hypochondriack*, *Melancholick*, and *Cholerick* Diſtempers. Every day Fevers have been common, with many Continual and Tertian: Malignant, Mortal, and Dangerous ones in a great Number, with *Deliria* and *Lethargies.* Where there has been any Infection cauſed by the Natural Malignity of the Air, infinite Mortality has followed. The Small-Pox has made great Deſtruction amongſt Children. And in ſhort, there has been no State nor Condition which has not had its ſhare in ſo Univerſal a Calamity.

The

The Number of the former Inhabitants of the Cities and Countries in Sicilia, *that were deſtroyed either wholly or in part by the Earthquake, as likewiſe of thoſe that periſhed therein.*

	The Number of the People before the Earthquake.	The Number of thoſe killed.
In *Agoſta*	6173	2300
S. Agata	1402	20
Avola	6225	800
Buſcema	2192	900
Bonaccurſo	844	94
Bontello	172	2
Butera	3492	
Buccheri	3295	300
Caltagirone	12339	800
Catania	18914	18000
Comiſo	5305	269
Caſtel di Jaci	331	32
Carleontini	2751	77
Caſſaro	1458	15
Chiaramonte	4830	303
Floridia	1037	20
Ferla	3610	800
Fenicia Moncada	1651	14
Francofonte	2039	345
Giarlatana	2981	541
Maſcali	1300	15
Maſſa Nunziata	394	55
Militello Val di Noto	6438	600
S. Michele	1838	1
Melilli	5480	900
Monteroſſo	234	232
Modica	18203	3400

In *Mazzarino*

	The Number of the People before the Earthquake.	The Number of those killed.
In *Mazzarino*	7696	
Nicoloſi	844	4
Nixemi	1483	
Noto	12043	3000
Occhielà	2910	100
S. Giovanni Lapunta	1082	15
Jaci Realé	12895	739
Jaci S. Antonio	6363	1335
Leontini	10063	1212
Licodia	4898	741
Mineo		1355
Palagonia	1862	29
Pedara	1582	475
Palazzolo	5571	700
Raguſa	9946	5000
Sortino	6316	2500
Syracuſa	15399	4000
Scichili	9382	2000
Scordia	907	33
Spaccafurno	7987	2200
Trezza		200
Trecaſtagni	3264	1000
Terranova	5289	
Tremiſteri	996	90
Vittoria	3950	200
Terra grande ò *Via grande*	1602	200
Vizzini	10678	2000
In all	254936	59963

II. *A Letter from Mon*^r Buiſſiere, *a French Anatomiſt and Surgeon, concerning an Egg found in the* Tuba Fallopiana *of a Woman lately diſſected; with ſeveral Remarks touching Generation.*

Monſieur,

JE vous envoye la deſcription que vous avés ſouhaité, de la maniere dont i'ay trouvé les trompes de la Matrice dans le Corps de la Femme que ie diſſequay dernierment, & dont vous avéz eſté en partie temoin oculaire.

C'eſtoit une Jeune femme d'environ vingt cinque, a vingt ſix ans, laquelle eſtoit accouchée il n'y avoit pas long temps, ce que ie recognus, 1°. Par les cicatrices de la cuticule du bas ventre encore recentes. 2°. Par la dechirure de la fourchete dont la cicatrice eſtoit toute nouvelle. 3°. Par la grandeur de la matrice & en fin par l'ouverture de l'ovaire du coſté gauche par laquelle l'oeuf qui avoit ſervi a l'enfant precedent, eſtoit ſorti, laquelle eſtoit encore fort large & dont le rabord paroiſſoit encore un peu dechiré; Cependant, quoy qu'il n'y eut pas long temps qu'elle fuſt accouchée, ſoit par un eſprit de debauche, ou peut eſtre dans la penſée que ſi elle devenoit groſſe on ne la feroit pas mourir, elle ſe divertit avec quelque ami ou peut eſtre avec quelqu'un des priſonniers, de maniere qu'elle conçeut: mais ayant eſté executée avant que l'oeuf impregné de la ſemence virile euſt eu le temps d'eſtre porté dans l'*Uterus*, lors que ie l'ouvris ie trouvay que la trompe du coſté gauche eſtoit extraordinairement dilatée vers ſon extremité, & ceſte dilatation dans la plus grande largeur eſtoit d'un peu plus d'un poulce de diametre & s'eſtendoit un peu plus d'un poulce & demi en diminuant du coſté de la matrice.

Cette partie ainſi dilatée ſe recourboit & embraſſoit preſque tout l'ovaire, a la membrane du quel elle eſtoit ſi fort adherant qu'elle n'en pût eſtre detachée que par force. Lors qu'elle en fuſt detachée il en ſortit une liqueur limpide & onctuëuſe, laquelle ſervoit aparemment ou pour relacher les membranes de la trompe a fin qu'elle ſe puiſſe dilater de maniere que l'oeuf puiſſe couler ayſement dans la matrice, ou poſſible a fin de graiſſer ce conduict a fin que l'oeuf n'ayt aucune peine a y paſſer, & peut eſtre pour tous les deux. J'examinay dabord ſi ie ne pourrois rien remarquer dans le corps de la trompe qui put produire cette liqueur, mais ie n'y pus rien remarquer bien q'elle fuſt beaucoup plus eſpaiſſe qu'a l'ordinaire. Cette eſpaiſſeur eſtoit cauſée par le gonflement de ſes fibres, qui eſtoient auſſi charnus que ceux des muſcles ordinaires, ce qui arrive ſans dout, dans cet eſtat ſeulement, a fin de luy donner aſſes de force & de mouvement pour exprimer l'oeuf (apres qu'il eſt detache de l'ovaire) & le pouſſer dans la matrice; Ma penſée eſt donc que cette liqueur contenüe dans la trompe vient de l'ovaire, & que les fibres & les petits vaiſſeaux lymphatiques ou autres qui ſe rompent pour ouvrir un paſſage a l'oeuf impregné, y laiſſent couler cette liqueur, de ſorte qu'encore que la dechireur de l'ovaire ſoit une playe & un Symptome, elle ne laiſſe pas d'eſtre utile & de produire des effects peut eſtre abſolument neceſſaires, ou pour la premiere nourriture de l'oeuf, ou pour la facilité de ſon paſſage dans la matrice, tant la nature ſait mettre toutes choſes a profit. Ce qui me confirme dans cette penſee eſt, que dans les femelles des animaux, de l'ovaire des quels ſe detachent pluſieures oeufs a la fois, cette liqueur s'y trouve en tres grande quantité. J'ay depuis peu eſté aſſez heureux que de trouver dans une Truye la meſme diſpoſition que dans la Femme, dans laquelle les trompes de chaque coſté qui embraiſſoient l'ovaire contenoient chacune environ trois a quatre onces de cette liqueur.

La trompe eſtant detachée de l'ovaire & la liqueur eſcoulée, l'oeuf parut a decouvert, il eſtoit de la groſſeur d'une Noiſette entouré de la liqueur au milieu de la cavité dilatée de la trompe, les trois quarts de cet oeuf eſtoient deſia hors de l'ovaire par le trou qu'il y avoit faict en ſorte qu'il ſembloit n'y tenir plus, cependant lors que ie voulus l'oſter, ie le trouvay encore attaché par un pedicule aſſez dur au travers du quel paſſoient les vaiſſeaux ſanguins pour s'aller diſperſer dedans & ſur l'oeuf. C'eſt par ces vaiſſeaux que le fœtus reçoit la matiere de ſon a-croiſſement & de ſa nourriture non ſeulement dans l'ovaire mais auſſi dans la matrice, ce pedicule devant ſervir a former le placenta (ſi ce n'eſt pas le placenta luy meſme deſia formé dans l'ovaire)en s'atachant au corps de la Matrice,c'eſt auſſi par la qu'il faut concevoir que l'eſprit ſeminal du Maſle eſt porté dans le corps du fœtus dans l'oeuf pour luy donner le mouvement & la fœcondité.

Il ne paroiſſoit Encore point de changement ſenſible dans la Matrice ſi ce n'eſt qu'il y avoit beaucoup de mucoſité ce qui eſt aſſez naturel ; la trompe du coſté gauche eſtoit dans ſon eſtat naturel auſſi bien que l'ovaire a l'exception de l'ouverture par ou l'oeuf de l'enfant precedent eſtoit ſorti.

Je vous Envoye la figure des matrices de la femme & de la Truye que j'ay eſté obligé de faire moy meſme n'ayant pu trouver perſonne qui entendit aſſez bien ces parties pour en faire un deſſein exact, ie n'ay jamais apris a deſigner, cependant a l'exactitude du deſſein pres, vous y verres les parties aſſez bien marquées, j'ay faict celle de la truye beaucoup plus petite que la Naturel, mais celle de la femme dans ſa toute grandeur, Je vous demande pardon Monſieur ſi ie ne vous l'ay pas Envoyée auſſi toſt que ie vous l'avois promis mais m'eſtant ſurvenu quelques affaires ie n'ay pu vous ſatisfaire plus toſt, Je ſouhaitreois avoir quelque autre choſe aſſez curieuſe qui put vous faire plaiſir, cela pourra ſe trouver avec le temps & alors ie ne manqueray pas de vous les communiquer, faictes moy cependant L'honneur de croire que ie ſuis avec ſincerité,

Monſieur,

Voſtre tres Humble, & tres Obeïſſant Serviteur,

A Londre, 15 *Janvier*,
169¾.

BUISSIERE.

Fig. I. *Matrice de la Femme.*

a a *Le corps de la matrice.*
b b *La trompe dilatée embraſſant,*
L'ovaire d.
c *L'oeuf impregné renfermé dans la trompe.*
E *L'ovaire gauche.*
F *Le trou par ou l'oeuf de l'enfant precedent eſtoit ſorti.*
g *La trompe gauche.*
h *L'artere hypogaſtrique.*
I I *Les ligaments ronds.*
K *L'oeuf detaché de l'ovaire.*
L *Le pedicule par lequel il tenoit encore a l'ovaire.*

Fig. II. *Matrice de la Truye.*

a a *Le vagina.*
b *La vulve.*
c *La veſcie.*
d d d d *Les cornes de la matrice.*
E E *Les trompes ou tubæ fallopianæ.*
F F *L'extremite des trompes dilatées embraſſant les ovaires, & pleines de la liqueur.*
g *Apendix des trompes.*
H H *Les arteres de l'uterus.*
i i i i *Les oeufs comme ils ſortent de l'ovaire.*
K K *Une des trompes detachée de partie de l'ovaire.*

III. *Remarks*

III. *Remarks, taken upon Diſſecting the Body of* A. M. *a Maid of about Thirty Years of Age, who dyed of an* Aſcites, *the Firſt of* Auguſt, 1689.

TO prevent the too impetuous Eruption of the contained Liquor (in caſe Inciſion had been preſently made) we made a Perforation of the *Abdomen*, in the moſt prominent part, as the Body lay along, by a *Paracenteſis*, extracting through a ſmall *Canula*, to the quantity of three Gallons: Afterwards we laid the Corps upon a Table, in the ſame poſture, where we made Inciſion, beginning between the *Umbilicus* and the *Cartilago-Enſiformis*, dilating ſtill as we emptied, till we had made room for a Quart-pot, with which we drew out, to the Number of Seventy Six good meaſured Quarts (accounting the three Gallons which were extracted before) of a ſubſaline and ſomewhat auſtere *Serum*, which amounts to the quantity of Nineteen Gallons, beſides what was imbibed with our Spunges, not improbably two Quarts more.

I did admire, whilſt we were emptying this Liquor, that I could perceive none of the *Viſcera* fluctuating in the ſame, which I have known cuſtomary, and I believe is common with moſt Hydropick Bodies; I remember 'twas the fear of this did once retard an Eminent Phyſician, from a *Paracenteſis* upon his Patient, leſt the Surgeon in making Perforation ſhould Puncture the Inteſtines. In this Body there was no interpoſing Body, *Parenchymatous* or Glandulous, to augment the Circumference of this Prodigious Inundation. For after the drying up the reſidue of this Humour (which in colour and conſiſtence did ſomewhat reſemble Water, wherein

Fleſh newly killed, had been waſhed, ſaving that it was of a ſomewhat deeper red, and had a more *Craſs Hypoſtaſis*) we plainly perceived (which was very wonderful) that the whole Bulk of this ſo ponderous a Deluge, was bore up and ſuſtained between the *Cutis* and *Peritonæum*; whereby there was made ſo great a Compreſſion of the Inteſtines, and other *Viſcera*, to the *Vertebræ Lumborum* and *Oſs Sacrum*, that 'tis very ſtrange to think how there could be any protruſion of Excrement, *per podicem*; ſince of neceſſity (by the aforeſaid Compreſſion) the *Motus Periſtalticus* muſt be very ſlow, if any at all, and ſecondly, the *Muſculi Recti* of the *Abdomen*, which are ſaid to be ſubſervient to that ſo neceſſary an Excretion, were not only at a very conſiderable diſtance, but even to my apprehenſion quite obliterated, or at beſt if there were any Rudiment of them left, it could not be diſtinguiſhed from the carnous *Pannicle*, or common *Tegument* of the Body; when at the ſame time the outward covering or *Cutis* it ſelf (notwithſtanding ſo vaſt and powerful a dilation) was full as thick (in ſome places much thicker) as in a ſound Body; particularly in the *Hypogaſtrick* Region, where the *Membrana adipoſa*, was obſerved to be above two Inches thick, and ſeemed to be no other than a *Congeries* of little Bladders, each of them contain'd in its proper *Capſula*, and impleet with a coagulated Lymphatic Juice.

One would reaſonably have conjectured, that the Blood in the *Abdominal* Veſſels, had been ſtagniz'd for ſome time paſt, or at leaſt had undergone a very depraved Circulation: For one might obſerve in many places, the grumous part had been thrown forth of its Veſſels, and adher'd in great clots to the Membranes.

Before I give you a more particular Deſcription of the contained Parts, I ſhall Remark what is no more than uſual; that her Thighs, Leggs, and Feet were *Anaſarcous*, and ſo extreamly elevated with a watry Humour, that upon a ſtrict impreſs I could have buried three or four Fingers: And yet her upper Parts, as the Neck, Face, Arms, and Hands were ſo wonderfully emaciated, that ſhe ſeemed much more like a Sceleton than a carnous Subſtance.

To recite the *Viſcera* in order as they appeared, after dividing of the *Peritonæum*, the firſt thing that ſhould have occur'd, is the *Omentum* or Kell; yet in this Body it was really and abſolutely waſted away, and had not left the leaſt apparent ſign, that there had ever been ſuch a thing.

The Inteſtines I could not perceive vitiated any other ways than in their colour, which was ſomewhat pallid, as if they had been ſeethed; and indeed the Internals for the moſt part, as the Ventricle, Pancreas, Liver, Spleen, Kidneys, &c. looked all of them like Fleſh half boyled, and the Blood abſorbed. For although, as I ſaid before, neither of theſe Bowels did ſwim in, or communicate with the *Serum*, being ſeparated by the aforeſaid Membrane; yet the great nearneſs of the ſuperincumbent Liquids had polluted and tinged the external Coats of the *Viſcera*, with their preternatural as well as putrefactive heat.

The Inteſtines were all of them diſtended with *flatus's*, particularly the *Cæcum* was blown up to a very conſiderable bigneſs; I obſerved in the two lowermoſt of the great ones, (*viz.*) the *Colon* and *Rectum*, ſome of the Excrements contracted like little Balls, and as hard to bear any impreſſion through the Coats of the Gut, as a Stone: From whence I do conjecture that ſhe had laboured under a conſiderable conſtipation of the Belly, and that for ſome time paſt.

The Liver (the Ancient's great Organ of Sanguification) which by ſome is adjudged to be particularly and principally miſaffected in this Diſtemper, we found no more faulty than the reſt of the Bowels.

There was a perfect adheſion of the whole Body of the Spleen to the *Peritonæum*, though with no great difficulty to be ſeparated from the ſame; for its colour and complexion it was ſuitable to the other Bowels, unleſs ſomewhat more livid, as it Naturally ſhould be.

Upon diſſecting the Kidneys, with a diligent inquiſition and inſpection of its parts, we diſcovered nothing (though before-hand Jealous) either in the *Carunculæ Papillares*, or in the *Infundibulum*, that could be any ways an impediment or let to the Secretion of the *Serum Sanguinis*, in caſe an Attempt had been made upon thoſe Parts by a *Criſis*.

The *Veſica Urinaria* was empty, and to my apprehenſion (by reaſon of its more than ordinary ſmalneſs) did not ſeem capable of any great diſtention. At the upper end or bottom of the *Veſica*, a little inclining to the left ſide of the *Rectum*, I perceived the *Uterus*, almoſt three Inches in length, and about two in breadth, it ſeemed to be nothing elſe but a little carnous Subſtance: its Body was depreſt, its Superficies ſmooth and glib, its internal part was ſomewhat rugous, although its Cavity when opened, would ſcarcely, I believe, have contained ones little Finger. It is really admirable that ſo ſmall a part as this, ſhould ſo wonderfully dilate and expand its Tunicles, as to afford Reception for a Human *Fœtus*; after whoſe Expulſion, it doth as it were by a certain innate propenſity, contract it ſelf to its Priſtine Magnitude; I cannot more fitly compare it (as I perceived it in this Body) to any thing, than the figure of a Pear ſomewhat depreſt.

The Ventricle had nothing contained in it but Wind, with which, like unto a blown Bladder, it would return after the leaſt impreſſion.

We come now unto the Parts contain'd within the *Thorax*, but before we ſpeak of them, I muſt tell you that I took notice of ſomething, I account admirable, and that was the unuſual ſituation of the Diaphragm, which we found ſo forcibly impell'd upwards into the Cheſt, that its *Diaſtole* muſt needs be very obſcurely aſſiſtant to Reſpiration: It was indeed ſo far contracted, that its Convex part bore hard againſt the Lobes of the Lungs, whoſe Subſtance, as I have ſeen in ſome that had dyed tabid, was very much decay'd and periſht, and looked juſt like par-boyl'd Fleſh.

The next and laſt Part which we viewed, was the Heart, and in this Noble *Viſcus* I diſcovered ſomething memorable, for upon cutting of it open, I did not perceive the leaſt drop of Water to fall from it: By which it may be juſtly thought that the *Pericardium* or *Capſule* of the Heart, being altogether deſtitute of its refrigerating Liquor, clung immediately to the proper Tunic of the Heart it ſelf; upon cutting through whoſe Ventricles, we could not perceive one drop of Blood, no more than in the reſt of the Bowels; nay, the Liver, which has been by ſome accounted the Store-houſe of the Bloody Maſs, was deſtitute of ſo much as might be thought neceſſary for its own proper Nouriſhment, and yet its *Salino-Sulphureous* Particles, which conſtitute the Gall, were depoſited into the *Veſica Bilaria*, to the quantity of about a Spoonful.

We took no other Survey of the Parts within the *Thorax*, than by opening of the Diaphragm, and looking up into the ſame: For ſince we had ſeen ſufficient Reaſon for the extinction of the Vital Flame, and by conſequence the Diſſolution of this Miſerable Creature, we contented our ſelves with what we had diſcovered in the *Abdomen* or lower Belly; and yet if we had been minded more narrowly to have viewed the Parts within the Cheſt, we might eaſily have come at them, without throwing up the *Sternon*, which is abſolutely neceſſary, and no more than cuſtomary upon a Survey of thoſe Parts: But in this Body I obſerved ſo large a protuberance ramæ of the *Coſtæ* and *Sternon*, that one might very eaſily have taken out either Heart or Lungs, without ſo much as touching their Encloſure. Whether this might not be occaſion'd from the rariſy'd *Effluvia* of the Waters, pent up within the Breaſt, or rather a neceſſary Conſequence of the Diaphragm's being ſo exceſſively preſſed upwards, I leave to a more Critical Cenſure; neither ſhall I take upon me to determine whether the contained Liquor happened from any Rupture in the Lacteal or Lymphatick Veſſels, according to Dr. *Willis*, or (as more probable to me) if it were not pure *Serum* (the Blood being diſſolved in its conſtituent parts) breaking forth of the little mouths of the *Cœliac* and other Arteries.

There were preſent at this Diſſection, Mr. *James Waſſe*, Sen. & Jun. *Daniel Turner*, Chyrurgeons.

IV. *Obſervatio Caſus non vulgaris De Hydrope intra Uteri Tunicas contento.*

E. R. a Perſon Aged 44, and upwards; ſometime after ſhe was married, had conceived (as ſhe thought) by ſome ſuppoſed Symptoms of Pregnancy, and in order to her Delivery, at the expiration of the time of her Account, her Midwife was conſulted. (Her fancy'd) Pains came on, and ſhe thought her ſelf very near her Labour. Her Belly was grown very big, and had gradually increaſed from the time of her (imagined) Conception; but alas, ſhe found her ſelf deceived in her Expectation, and her Preparations for this time all in vain. Her illneſs ſhortly after wore off, without leaving any Prognoſtick of an approaching Birth.

Thus ſhe continued, growing bigger and more indiſpoſed, till twice the time of her Reckoning was compleated.

Thoſe whom ſhe conſulted for help, knew not by what means to relieve her, as not knowing what her Diſtemper was. Some thought ſhe had a Tympany, ſome that ſhe was Aſcitical, and others that ſhe carried a dead Child in her Womb.

She had taken much Phyſick, but without relief, and at length made her Application to Dr. *G*— who, after Enquiry into the Circumſtances, put her in great hopes by his Perſwaſions, that ſhe might be with Child, and by the taking ſome few of his Preſcriptions, in all probability ſhe was to be delivered very ſpeedily of a Humane *Fœtus*, either alive or dead. Theſe Remedies were taken as ineffectually as many others; ſo that now ſhe began to deſpair of Recovery, yet lived many Months afterwards: And laſt of all, at three Years end (from the time ſhe thought her ſelf Pregnant) ſhe refer'd her ſelf to one Dr. *N*— a Profeſſor of Phyſick as well as Midwifery. She was now again under a Courſe of Phyſick, and had taken many powerful Hyſterick, and other Uterine Remedies.

It was now without much Queſtion concluded that ſhe labour'd of a *Mola*, or that a falſe Conception was engendred by one of Nature's Aberrations inſtead of a true one. The Cauſe being now (as was thought) found out, there remained nothing but to endeavour its expulſion: This was attempted with no better Succeſs than formerly; ſo that after all ſhe removed into the Air, where ſhe had not continued long, before ſhe languiſhed and dyed.

There remained nothing but the opening of the Body, which was concluded on, in order to detect this ſo occult and contumacious a Diſtemper. We who were to make the Inſpection, met with her Phyſician, and (the

Corps being laid as advantagiouſly as might be) we began our Inciſion from the *Umbilicus* tranſvers the *Abdomen*, to the *Ilia:* And from the ſame centre another Inciſion direct to the *Os Pubis.* Here was now an expectation on all hands of ſomething rare and Monſtrous, when on a ſudden one of the Diſſecters (little thinking what was ſo near) in cutting through the *Peritonæum*, accidentally thruſt his Knife too far, and immediately there aroſe a Spring, as it were, of a limpid *Serum* or *Lympha*, as clear as Water from a Fountain, riſing up a very conſiderable height, and with great impetuoſity.

This put an end as well to Conjecture as Diſpute, we now fully concluding the Diſtemper to be an *Hydrops Uteri*, or a Dropſie contain'd within the Cavity of the Womb. Having emptied the containing part of its Water, which in quantity did ſomewhat exceed two Gallons or eight Quarts; we proceeded to ſatisfie our ſelves wherein this Deluge had been contained, we found its encloſure was a thin tranſparent Membrane; and yet notwithſtanding its extraordinary Dilation, I could not perſwade my ſelf that it was the entire Body of the *Uterus* it ſelf: Upon a more ſtrict ſearch, when I turned this Membrane to the right ſide, I perceived underneath this outward Tunic, or (as I thought) adhering to it, a more carnous Subſtance. To clear this ſuſpicion the *Os Pubis* was divided, which finding very difficult to be performed with a Knife, I finiſh'd with a ſmall Saw.

I cannot chooſe but take notice in this place, of ſome People's over-credulity, and to wonder that we ſhould be ſo eaſily perſwaded to ſet the Light of our Underſtanding in the dark Lanthorn of Authority, when we take for granted, that theſe Bones, *viz.* the Share or Pubes, do ſeparate or part aſunder of their own accord in time of Travel, in order to facilitate the Birth of the *Fœtus*.

The *Pubes* being divided, we paſſed in a Probe through the *Pudenda*, into the *Vagina Uteri*, and having traced it as far as it went, by looking into the *Pelvis*, and ſearching for that Carnous Subſtance I have already ſpoken of, we found it to be nothing leſs than the *Uterus* it ſelf, when cutting into its Body, we perceived the end of the Probe already entred in the *Cervix* or Neck thereof. So that (what ſeemed to us ſtrange) we were at length aſcertain'd of the Truth, and convinced that the aforeſaid Water was contained in the external Tunic of the Womb, whoſe great weight had thruſt the Body thereof perfectly on one ſide, and hindred an admiſſion of ſearch from the *Vagina*, towards the *Fundus Uteri*, the *Cervix* thereof being kept cloſe as in a true Conception.

One of the great Indications of this Woman's Pregnancy, was a Flux of a whitiſh or pallid Humour to her Breaſts, which ſhe could ſqueeze out at pleaſure, and thought it to be no other than Milk generated therein in order to the Nutrition and Conſervation of a future Birth.

She had likewiſe labour'd the greateſt part of the time under a Suppreſſion of the *Menſes*, whoſe reflux to the Breaſts, when an alteration had been induced by its Glandules, might as I conjecture (iſſuing from the *Papillæ* under a ſubalbid form) be taken for Milk, and give grounds of a ſuſpicion that ſhe had conceived. But I ſhall leave the Ætyology of the aforeſaid *Phænomena* to the more Curious Indagator of Anatomick Myſteries.

There was preſent at this Diſſection,
Dr. *N*---
Mr. *Thomas* / *John* *Lichfeild*,
Daniel Turner,
Chyrurgeons.

V. *De Morſu venenoſo Canis rabidi.*

IN the Year 1688 there was brought to us for Cure a Child of about Three Years of Age, who had juſt then received a large Wound upon the Maſſeter Muſcle by the bite of a Dog. The Child was ſitting upon the Threſhold of the Door, and a Dog came running by him, upon which another Dog comes out upon the former, and in the ſcuffle the Child received this Accident from the ſtrange Dog, whom the People ſuppoſed to be Mad, as it after was made evident.

The Wound we treated with Digeſtives for ſome time, Sutures were forborn, though otherwiſe neceſſary, that the Sanation thereof being defer'd, the contracted Venom might have the freer egreſs thereat. There was in a ſhort time diſcharged a very laudable *Pus*, and the Wound incarned as faſt as we could deſire; there was no ſupervenient Humour,or Inflammation that attended, nor any other apparent Symptom that could preſage what followed.

In about three Weeks time we had incarned,and brought over a very firm and ſeemly *Cicatrix*; and in about two days after Cicatrizing the Wound, the Child was ſeized with a Fever, a diſorderly Pulſe, and Palpitation of the Heart: The Night enſuing he grew *Delirious*, and the ſucceeding Day the Malignity had made ſo virulent an impreſſion upon the Animal Spirits, as did excite very ſtrong irritations in the Members of the Body, by convelling of their Muſcular Fibres. Neither was the Brain and its parts freed from the ſame Morbid taint, which manifeſted its ferocity in a moſt ſtrange and unuſual diſtortion of the Eyes, from a confuſed and irregular expanſion of the Optick Nerve, attended with an extraordinary fierceneſs in the whole Viſage, continual

Vigilies, and a conſtant Trepidation, with a reiterated ſnatching up of the lower Mandible, making ſigns as if he would have bit at any thing that was offered him. His Voice was uttered with a Canine hoarſeneſs, and had an extraordinary reſemblance to the barking of a Dog. He was moreover infeſted from that time with a *Singultus*, and foaming at the Mouth. Thus he continued the moſt part of the Day: being with him for a conſiderable time, to obſerve theſe wonderful *Phænomena*, I took the occaſion (out of Curioſity) to preſent a Looking-glaſs before him, but found him ſo extreamly diſturbed thereat, that I immediately took it away: He was no ſooner ſenſible of the Reflection, than that he threw his Head backwards with great violence, and continued barking, and ſnapping at every thing near him: In the Evening, notwithſtanding ſuch Alexipharmicks as had been exhibited, he ſunk under the Oppreſſion of theſe cruel Symptoms. I would very deſirouſly have opened his Body, but it was forbidden by his Parents. The *Abdomen*, I perceived, was exceſſively inflated, his Limbs convulſ'd, and the ſuperfice of the Body of a livid colour; the Muſcles of the Face were drawn into ſuch a form as did nearly repreſent a *Spaſmus Cinicus*.

VI. Solutio Problematis Florentini de Teſtitudine Veliformi Quadrabili, a *Davide Gregorio*, M. D. ac R. S. S. Communicata.

PRodiit Florentiæ Anno MDCXCII. *Ænigma Geometricum de miro opificio Teſtitudinis Hemiſphæricæ quadrabilis quod eo ſpectabat ut detractis ex Hemiſphærica Teſtitudine quatuor æqualibus ſimilibus ſimiliterque poſitis feneſtris, reliqua Hemiſphærica ſuperficies ſit quadraturæ*

verè Geometricæ capax. Nec diu poſt Ænigmatis Auctor conſtructionem Problematis ingenioſe admodum & expedite dedit in tractatu Italico de formatione & menſura Teſtitudinum omnium ad Sereniſ. Etruriæ Principem ubi & nomen ſuum profiteri dignatus eſt, nempe à V.V. poſtremo Galilæi Diſcipulo, cum antea diſpoſitis horum verborum ut in Anagrammate elementis, ſub ficto nomine D. Pio Liſci puſillo Geometra tectus latuiſſet.

Verum conſtructionis demonſtrationem celat Author. Illam, cum Viris Doctis non ingratam futuram pro comperto haberem, libuit paucis proferre. Præſertim cum nunc primum aſſignetur portio ſuperficiei Sphæricæ quadrato æqualis. Ænigma igitur ab Auctore in ſequens Problema convertitur.

Super hæmiſpherii ſuperficiem aſſignare portionem dato quadrato æqualem quod ſic conſtruit.

Sphæra cujus Axis æqualis lateri dati quadrati exponatur Vid. Fig. 3. per circulum ACBD in propoſita Sphæra verticalem, cujus diameter horizontalis eſt AB, centrum E. Perforetur Sphæra duobus cylindris rectis quorum communes ſectiones cum plano ACBD ſunt circuli BLEG, AHEI diametris EB, EA deſcripti. Dico factum; hoc eſt à quolibet hemiſphærico Ver. Gr. ſuperiori ACB ablatas eſſe per Cylindros perforantes quatuor figuras bilineares, duas ſiz. in parte antica & duas in poſtica æquales ſimiles & ſimiliter poſitas, ita ut reſidua ſuperficies hemiſphærica ſit æqualis quadrato rectæ AB. Et quoniam hemiſphærica ſuperficies, demptis ſpatiis quatuor bilinearibus prædictis, refert velum vento inflatum & tenſum, Teſtitudinemve hemiſphæricam quatuor feneſtris interruptam quæ circulari baſi AEB impoſita, ipſi ad puncta A, E, E, B innititur, hanc pro jure ſuo appellat Teſtudinem Veliformem Florentinam quadrabilem, Vela Quadrabile Fiorentina.

Auctor deinceps in memorato tractatu plurima ad praxin attinentia profert, ut ope Torni & Terebræ cylindricæ tam hujus quam reliquarum quinque Teſtudinum fiant exemplaria: Atque in hanc rem alia quædam Problemata ſubtilia *conſtruit quorum omnium demonſtrationes ab Auctore conſulto ommiſſæ facillime ex nunc proferendis conſequuntur*

Quod quatuor feneſtræ in hemiſphærio ut dictum eſt extructæ ſint figuræ æquales ſimiles & ſimiliter poſitæ ſatis liquet, reliquum eſt ut oſtendamus reliquam ſuperficiem hemiſphæricam tetragoniſmi vere Geometrici eſſe capacem.

Ad Plannm CADB *in puncto* E *erigi intelligatur normalis recta æqualis* EA; & *ſuper peripheriam* ACBD *ſuperficies cylindrica recta ejuſdem altitudinis. Vulgo notum eſt portionem ſuperficiei Sphæricæ inter quælibet duo plana circulo* ABCD *parallela comprehenſam æqualem eſſe portioni ſuperficiei cylindricæ inter eadem plana;* & *horum annulorum ſimiles portiones reſectas à planis in erecta ex* E *normali ſe mutuo interſecantibus eſſe etiam æquales. Si jam ducendo innumera plana baſi* ACBD *parallela dicto modo deſignari intelligantur in ſuperficie cylindrica partes reſpondentibus Sphæricis æquales, quæ è regione ſuperficiei perforatione ablatæ deſignatur illi æqualis eſt. Quare patet reſiduam à perforatione ſuperficiem æqualem eſſe reſiduæ ſuperficiei cylindricæ dempta illa quæ è regione ablatæ per dicta innumera plana deſignatur. Ducatur diameter quælibet* PM *ſecans peripheriam* AHE *utcunque in* H. *Jungatur* HA, *per* H *ducatur* RT *normalis ad* AB & *parallela ad* CD *per* E *ductam, occurrens peripheriæ* ACBD *in* R & T & *peripheriæ* AIE *in* I. *Super* RT *diametro fiat ſemicirculus cujus peripheriæ occurrant* HS, IQ *ad* RT *normales in* S & Q. *Hujus ſemicirculi planum intelligatur normaliter erectum ad circulum* ABCD. *Unde peripheria* RSQT *erit in ſuperficie hemiſpherica, rectaque* HS *nunc ad planum* ACBD *normalis, erit altitudo ſuperficiei cylindricæ perforantis ſupra baſeos punctum* H. *Idemque de quolibet puncto ſuperficiei cylindricæ perforantis verum eſt, ſiz. ejus altitudinem uſque ad ſuperficiem Sphæræ ſupra quodvis in baſi punctum* H, *eſſe rectam* HS, *ut dictum eſt, genitam, ſed* HS *æqualis eſt* HA *ſinui recto arcus* MA, *quoniam tam hæc quam illa eſt media Geometrica inter* PH

&

& H M, *altera in circulo* M A P *altera in circulo Sphæræ etiam maximo per puncta* M, S & P *tranſeunte.*

Si in erecta in E *ad planum* ACBD *normali, ab* E *ſumatur recta æqualis* HS *aut* HA & *ab extremo ejus puncto ducantur rectæ parallelæ ad* PM & VN, *planum per illas extenſum erit ad planum* ACBD *parallelum,* & *rectæ hæ per puncta* S & Q *tranſibunt,* & *productæ uſque ad ſuperficiem cylindricam hemiſpherio circumſcriptam abſcindent ex lateribus cylindri rectas ipſis* HS *vel* HA *itidem æquales; comprehendentque arcus æquales* & *reſpondentes arcubus* MN & VP. *Quod ſi alterum planum hinc ad minimam diſtantiam parallelum ſimiliter ductum intelligatur, hæc duo per ſupra oſtenſa deſignabunt in ſuperficie cylindrica annuli portionem æqualem portioni inter eadem plana à ſuperficie hemiſphærica perforatione ablatæ. Quod ſi ſimilis conſtructio fieri ſupponatur ad quodlibet in peripheria* AHE *punctum portiones omnes in ſuperficie cylindrica hemiſphericæ circumſcripta dicto modo genitæ* & *deſignatæ erunt æquales ſuperficiei Sphæricæ perforatione ablatæ. Quare reſidua ſuperficies hemiſphærica æqualis erit reliquæ ſuperficiei cylindricæ conflatæ ex rectis omnibus* HA *ad reſpectiva puncta* M, N, V & P *erectis, ſeu figuræ ſinuum rectorum ſemiperipheriarum* ACB ADB, *hoc eſt, per dudum à Geometris cognita, quadruplo quadrato Radii* AE, *ſive denique quadrato diametri* AB. *Cumque duæ integræ figuræ comprehenſæ à communi ſectione prædictæ ſuperficiei cylindricæ perforantis cum ſuperficie Sphærica, æquales ſint quatuor ablatis quatuor ſpatiis bilinearibus (ut ſupra in conſtructione) æqualem eſſe quadrato diametri* AB. *q. e. d.*

Si ſemiperipheria AHE *ita inflectatur ut congruet cum æquali quadrante peripheriæ* ARC; *punctum* H *incidet in punctum* M *ob æquales arcus* AH, AM, & HS *altitudo ad* H *ſuperficiei cylindricæ ſuper* AHE *inſiſtentis congruet cum æquali* HA *altitudine ad* M *figuræ ſinuum rectorum ſuper* AMC *erectæ; idemque in reliquis punctis fiet.*

Vnde curva quæ èſt communis interſectio ſuperficiei Sphæricæ cum ſuperficie cylindrica ſuper baſi AHE, *quamvis non jaceat in eodem plano inflexa, ut dictum eſt, congruet & proinde æqualis eſt curvæ terminanti figuram ſinuum rectorum; hoc eſt communi Sectioni ſuperficiei cylindricæ ſuper quadrantalem arcum* ARC *erectæ cum plano ſecante planum baſeos in erecta* BA *ad angulos ſemirectos; ſive quadranti curvæ Ellipſeos cujus minor Axis eſt* AB *major vero poteſt hujus duplum. Adeoque perimeter veli quadrabilis Florentini ex hujuſmodi quatuor conſtans æqualis eſt perimetro dictæ ellipſeos.*

Sed & hoc amplius adnotare non pigebit, ſuperficies cylindrorum duorum perforantium intra Sphæram, æquales eſſe ſuperficiei Sphæræ poſt perforationem relictæ, ſive duplici Velo Florentino, hoc eſt duplo quadrato diametri. Atque hoc exinde patet quod Velum Florentinum æquale ſit figuris quatuor ſinuum rectorum quadrantis & ſuperficies perforans iiſdem etiam ſit æqualis, quoniam illis congruit ſi inflectio fiat ut ſupra.

Hoc tantum addam, Conſiderationem figuræ ſinuum rectorum [cujus etiam partes in quadrata facile mutantur] ſufficere ad demonſtrationem eorum omnium quæ de aliis ſolidis torno elaboratis vel cylindro perforatis, eorumque ſuperficiebus ab Acutiſſimo Geometra V. V. [Vincentio Viviani ni fallor] digniſſimo Galilæi Diſcipulo proferuntur; dum fabricam & Menſuram Teſtudinum docet. Speciatim ſuperficies Teſtudinis Scaphoidis Romanæ Volta a Schifo alla Romana *ex octo figuris ſinuum rectorum arcus quadrantalis conſtat, ac proinde Teſtudini Veliformi Florentinæ æqualis eſt. Vnde patet quomodo æqualibus quadratis ſuperimponi poſſunt duæ Teſtudines quarum altera eſt undique clauſa altera quatuor feneſtris interrupta, utraque quadrati baſeos dupla.*

Ex ſupra demonſtratis reliqua facile eliciuntur, cum præcipua quæ celare voluit Auctor hactenus demonſtrentur.

VII. *Obſervatio Anatomica rara de Calculo in Rene invento à Cl. Viro D$^{re.}$* Wittie, *R. S. haud ita pridem Communicata.*

GEneroſa quædam annorum 31 modeſtiâ, prudentiâ, pietate, tamque formâ corporis quàm animi dotibus omnibus numeris abſoluta, Anorexiâ ac ventriculi dyſcraſiâ diù laboraverat, ut vel parùm appeteret, & ne quicquam deglutire poſſet, quod non ſtatim evomuit, cum copioſâ æruginoſæ bilis per alvum dejectione. Ad hanc accitus multa adhibui remedia Ventriculi viſcerumque tono labefactato appropriatiſſima, undè aliquandiù meliùs ſe habebat, ut per aliquot Menſes quotidiè in apricum prodiret. Verùm in herbâ latebat Anguis, qui ipſam mordicùs tenebat miſeram, ut non modò in dicta Symptomata recidivationem pateretur, ſed & omnia Remedia quæ illi priùs fuerant proficua prorsùs reſpueret, imò ab eis (quid ni dixerim) penitus abhorreret, ut Morbus nullis Medicamentis ab Arte Medicâ excogitatis eſſet emendandus. Obſervavi enim prædicta Symptomata à Calculo in Rene ſiniſtro hoſpitante proceſſiſſe, undè novam querelæ anſam ei ſubindè ſuſpicatus ſum, & prædixi. Ipſi tandem Menſe *Julii* Aquas *Epſamenſes* acidulas vehementer appetenti, & tunc temporis Tertianâ nothâ inſuper detentæ, ſuadebam, ut Aerem iſtum purum aliquandiù inſpiraret, ac Septimanas aliquot hilariter tranſigeret inter Hydropotas, Aquas verò ut parciùs biberet, nè indè calculoſa Symptomata magis irritarentur. Poſt duos Menſes reverſæ omne vergebat in deterius, ut nec quovis Cardiaco per vices, nec Cibo reficeretur, nec in utrumvis Latus præ dolore decumbere poſſet. Ipſa tandem inter Mulieres Optima, innumeris preſſa Symptomatis, Animam in Salvatoris ſinum placidiſſimè expiravit 28 *Januarii* 16$\frac{79}{80}$.

Die ſequenti, accerſito Chirurgo cum conſenſu Amicorum, coram variis primæ notæ Teſtibus cadaver aperuimus, ut Morbi cauſam penitiùs inveſtigarem, aliiſque detegerem.

Pulmones malè colorati, ſubnigri ſcilicet, plùs juſto apparuerunt, ac dextrum verſus computruiſſe videbantur, ut Phthiſeωs impendentis (ſi diutiùs vixiſſet) metum incuterent.

Ventriculus ultra modum diſtentus, ac ad inſtar Veſicæ inflatæ tumefactus proximè emicuit, ut vel indè ob tenuitatem, ac fibrarum ſolutionem Tonus ejus neceſſariò debilitaretur, & ingeſta vel ſtatim vomitione rejicerentur, vel in alvum cruda ſponte defluerent.

Corculum admodùm exile, ac inſtar vacuæ Crumenæ molle deindè conſpeximus, cujus Parenchyma, diuturniori Febris ſupra dictæ atque Hectices indè ſequentis Calore, in liquore proprio eliquatum, mollitiem contraxerat: Et quidem indè factum eſt, ut Pulſum conſtanter haberet undulantem, ut verſus finem vix ſentiri poſſet, quin ἀσφυξίᾳ detineretur.

Jecur quidem ſat ſanum, at ſupra modum extitit largum, quod non ſolùm dextrum pro Naturæ inſtituto occupaverat, ſed & ad ſiniſtrum Latus mirificè extendebatur, atque illud etiam implebat; ut non multò minus ad lævam abdominis partem extiterit, quàm quod in aliis Lege Naturæ in dextrâ conſpeximus, ut Lienem indè depauperatum cenſeremus, qui parvus plus juſto fuit & exilis. Et quidem Jecur utrinque (nempe tàm in Siniſtro quàm Dextro latere) adeò pertinaciter per totum adhærebat, præcipuè in dextro, ut à Chirurgo non ſine vi ac difficultate divelli poſſet. Et quidem hinc evenerat ut per aliquot Menſes in latera dormire nequiret, nedùm ſine dolore in utrumvis inclinare, quin Hepar juſto gravius Peritonæum, Membranam ſenſus exquiſitiſſimi doloroſè diſtenderet, & Ventriculus præter modum debilis ad vomitionem à compreſſione ſtimularetur.

In concavâ utriuſque Hepatis parte (ſi ita mihi loqui liceat, cum reverâ unicum tantum eſſet in utrumque latus protenſum) delituit veſicula fellea, ita ut planè duæ extiterint, à ſe invicem per longitudinem manus meæ ad minimum diſterminatæ, bile turgidulæ; quæ verò ad lævum Hepar adnaſcebatur, alterâ minor erat, & quidem nigrior.

Ad Renes tandem deventum eſt, quorum Dexter ſcopo Naturæ ordinario in unaquâque re conformis erat; neque in ea regione (quantum novi) de minimo Symptomate querebatur Ægra. In Siniſtro autem, ubi Morbi fomitem, Mortiſque cauſam ineſſe ſemper dixeram, Calculum non admodum gravem quidem, aut ponderoſum, (cùm ſemiunciam non excederet) ſed miro modo tortuoſum evulſimus, ceu creta albidum, ac inſtar Radicis alicujus in tres ſurculos medio connexos, divaricatum, ad latitudinem trium digitorum. Eheu! Quantos dolores iſti Mulierum optimæ ipſa Calculi Figura peperat, quæ triplici cuſpide Renem compreſſerat, ut in formam ſui ſimilem diſtorqueretur Parenchyma! O quantæ Vomitiones indè ſupervenerant! Ni & illas duabus felleis Cyſtibus bilem copiosè nimis in Ventriculum refundentibus, ut cauſæ partiali tribuendas cenſeamus. Nequè verò dubitandum eſt, frequentiores alvi dejectiones, à copioſiori quantitate bilis æruginoſæ inteſtinorum, Facultatem expultricem proritantis ſubindè proceſſiſſe.

An Account of BOOKS.

I. Oſſervationi Naturali, ove ſi contengono materie Medico-Fiſiche, *&c.* *Natural Obſervations, containing ſeveral* Medico-Phyſical *and* Botanical *Matters, with divers Natural Productions, ſeveral ſorts of* Phoſphori, *Subterraneous Fires in* Italy, *and other Curious Subjects, in Familiar Letters, by Signior* Paul Boccone, *M. D. Printed at* Bononia *in* 12°. 1684.

OUR Commerce with the *Italian* Bookſellers having been for ſeveral Years leſs conſtant, it may not be amiſs to preſent the Reader with an Account of ſome of the moſt Curious relating chiefly to Natural Hiſtory or Philoſophy.

I ſhall begin with an Abſtract of this Miſcellaneous Treatiſe of the Ingenious *Boccone*, written in *Italian*, and containing Twenty Six ſeveral Obſervations. The Author had formerly publiſht in *French* Natural Enquiries and Obſervations on *Corall Aſtroites*, &c. at *Paris*, *Anno* 1671. reprinted afterwards at *Amſterdam* in 1674. and at *Oxford* his Icons and Deſcriptions of the rare Plants of *Sicilia*, &c. were Printed *Anno* 1674.

In the Firſt of the Obſervations contained in this Tract the Author treats of the Effects, Cauſes, and Preparation of the *Noctiluca* or *Phoſphorus Aërous*, as it was made by the Honourable *Boyle*. The 2*d. Obſ.* is of Subterraneous Fires and their *Phænomena* and Cauſe from the Effervеſcence of an Acid and Alcali, with an Ethereal or Subtile Matter interpoſed. The 3*d. Obſ.* is of

Cures and Preſervatives from the Plague, where he ſo much extols Veſicatories, which in the Year *1656* preſerved as many as made uſe of them, when the Plague was very hot at *Genoa.* And here he Obſerves by the way, that the Root of *Colchicum* is no other ways a good Remedy in this caſe, than as being a ſort of gentle Veſicatory, from the Acrious Particles of which it conſiſts, and not as an Amulet; as ſome have ſuppoſed. In the *4th. Obſ.* He Diſcourſes of the Iron Rings made of the Nail (taken out of a Stone-Horſe's near Foot before) by hammering only without Fire, as good for the Cramp and Giddineſs, worn on the Ring-Finger, which if of any prevalency, he ſays it is from the Volatile Particles it received from the Horſe's Hoof, and not as any Charm. The *5th. Obſ.* Contains a Catalogue of Natural Effects uſually attributed to Sympathy. The *6th. Obſ.* Treats of a *Succedaneum* to Crabs-Eyes, of the little Chalky Stones found on the outſides of the *Scait* Fiſh on the *Paſtinaca Marina, &c.* The *7th. Obſ.* Is of ſeveral rare Plants, and ſome Empirick Remedies chiefly againſt Witchcraft. The *8th. Obſ.* Deſcribes a certain Smoaking Liquor made of *Mercury* and *Tin.* The *9th.* Diſcourſes of yellow and black Amber found in divers Places of *Italy*, a new Diſcovery to moſt. The *10th. Obſ.* Is of the Bed of a certain Inſect (not unlike thoſe with ſeveral little Cellules made by Bees or Flies in hollow Trees, or on the Leaves of Plants) found in the midſt of an Oyſter-ſhell in Mount *Marius.* The *11th. Obſ.* Is of ſeveral Animalcules found in little ſhelly Tubes. The *12th.* Treats of the Vertues of ſeveral Plants for divers Diſeaſes of Beaſts. The *13th.* is of a certain Man that after his Wifes Death ſuckled his Child at his own Breaſts, *Anno* 1633. which he confirms by a Credible Teſtimony. The *14th. Obſ.* Gives us an Account of the ſeveral *Muſeums* or Repoſitories of Curioſities to be ſeen in *Italy.* The *15th. Obſ.* Diſcovers the Author's Method of Preparing the *Bononian* Stone or *Phoſphorus:* to which is ſubjoyned a Curious Obſervation communicated to him by *Joh. Baptiſta Martelli*, concerning Humane Urine. The 16*th. Obſ.* Enumerates ſeveral Earthy Concrets, good for abſorbing and correcting Acids. The 17*th. Obſ.* Defends the harmleſs uſe of *Antimony*, much eſteeming the *Panacæa* made of crude *Antimony* with fixt Nitre, deſcribed by *Fr. Lana*, in his *Prodromus, p.* 126. The 18*th. Obſ.* Diſcovers the wonderful Texture of the Root of the *Perfoliata Alpina latif. min. Bauhini*, made up of many Membranes curiouſly complicated together; by which Signature he ſuppoſes it good for Ruptures, and the rather becauſe another *Species* of *Perfoliata*, by *Chabreus* called *Auricula Leporis*, has been uſed with Succeſs in that caſe. The 19*th. Obſ.* is concerning a Spring, called *Pliny*'s, and the River by the Inhabitants now named *Torbidone;* which Fountain in *April*, *Anno* 1680. in a quarter of an hour riſe three Inches perpendicular, and ſunk down again in half an hour's time, repeating this Flood and Ebb alternately every two hours; which Phænomenon was obſerved not two days, as is uſually there thought, but only a few hours before a ſhower of Rain. In the 20*th. Obſ.* He ſhews that the Musky ſmell coming from ſome Piſmires and Flies of *Piſa*, proceeds only from Sulphureous Particles mixt with a Volatile Salt in the Dung of thoſe little Animals. In the 21*ſt.* He gives four Reaſons why ſome Plants are green all the Year. 1. From the abundance of Oily Particles, as in *Tanſey, &c.* 2. A more Craſs and Viſcous Subſtance, as in the *Semper-vivum maj.* &c. 3. A very much interwoven texture of the Fibres of the Leaves, as in *Opuntia, Aloe Americana*, &c. 4. A more hard and cloſe outward Skin, with which the Leaves are covered, as in the *Laurus Alexandrina, Box*, &c. The 22*th. Obſ.* Deſcribes a peculiar ſort of Inſect, which he found on the Leaves of the *Myrtus Tarentina* at *Rome*, *Anno* 1678; they were of a grey colour, and a convex figure, like the half of an Hempſeed, and by the Microſcope ſhewed ſcaley or plated like the *Millipedes*; being rub'd and bruiſed on a Paper, they gave it a curious Purple colour, whence he conjectures they are a-kin to the *Cochinille* Inſect, which *Paulus Ammannus in Manuduct ad Materiam Med.* likens to the *Cimices*, and ſays, that they are found on the *Ficus Indica*. In the 23*d. Obſ.* He adds ſome other Reaſons of the continual greenneſs of ſome Plants, which, though defended with but a thin Skin, yet reſiſt the cold of the Winter, by reaſon of its being of a like texture with that of a Man's, which the Microſcope diſcovers, and ſo is capable of affording the ſame defence; ſuch are *Arum*, *vulg. Braſica*, *&c.* But ſome Plants, though of a ſolid texture, cannot endure the alterations of the Seaſons, from the vehemence of the South Winds, and want of ſufficient Moiſture in themſelves. In the 24*th. Obſ.* Several Prodigious Effects of Sulphureous Exhalations in divers Parts of *Italy*, are related. In the 25*th. Obſ.* He adds ſome more thoughts concerning the *Sal Ammoniac* he found on *Iron-Scoria* thrown up by *Ætna* in the Year 1669, to thoſe he had formerly publiſh'd in *Diſquiſit. & Obſerv. Phyſicis circa Corallium, &c. Edit. Amſt. p.* 47. Anſwering a Queſtion propoſed by *Menzelius* about the *Bononian* Stone. Laſtly, In the 26*th Obſ.* He aſſerts the great Vertue of a Mineral *Bezoar* found in *Sicily*, confirming it with the Cure of an *Epidemick* Fever in a Virgin of Nineteen Years old, when all other *Alexipharmicks* had proved unſucceſsful, provoking a conſiderable Sweat, and throwing off the whole *Cuticula*; and ſhews the reaſon of this Cure.

This Ingenious Searcher into Nature, not ſatisfied with what he has already preſented the Curious, in a Letter dated at *Palermo, Decemb.* 4*th.* 1693. directed to the Secretary of the *Royal Society*, promiſes in a ſhort time to Publiſh another Book of 250 new Plants lately gathered by himſelf in *Sicily*, graved on 120 Copper Plates; of which the Title will be, *Muſeo di Fiſica e di Eſperienze, arricbito di Figure di Piante nove, Oſſervazione, Note Medicinali, e Ragionamenti, ſecondo i Principii di Neoterici, diſpoſito in Decade VIII.*

In the ſame Letter he tells us, that the *Lychnis Pſeudomelanthio ſimilis Affricanus glaber anguſti-folius, Pauli Hermans*, is the ſame with the *Lychnis Calyce duriori Bocconi Ic. & deſcr. Rar. Plant.* The *Stachis Betonicæ folio ſubincano P. Herman.* is the *Horminum Spicatum Lavendulæ odore Bocconi*: And that theſe with ſeveral other rare Plants deſcribed by late Authors, are found frequently in *Sicily*.

He likewiſe Propoſes a new Scorbutic Plant, which from the Analogy of ſeveral external Notes and Characters he thinks may prove a very good *Succedaneum*, where the *Cochlearia folio ſubrotundo Caſp. Bauhini* is leſs plentiful, *viz. Thlaſpi Leucoii folio latifolium platicarpos Siculum, ſemper virens & ſemper florens.* This Plant having a very biting taſte, a thick leaf, and ſmell like the *Cochlearia*, confirms his Conjecture, beſides the Generical Note of the Seed, the moſt certain Indication, and ſure Guide to diſcover the Qualities of unknown Plants, according to *Fabius Columna*, and *Andreas Cæſalpinus*. This he ſubmits to the Tryal of Phyſicians; obſerving that they chooſe out amongſt the ſeveral *Species* of the *Anagallis aquatica* that called *Anag. aqu. maj. folio ſubrotundo*, C. B. Pin. poſſibly becauſe of the Saline, Nitrous, and Acid Volatile Particles found in its Leaves, which abound alſo in Scurvy-graſs, and this *Sicilian Thlaſpi*.

II. Lezioni intorno alla Natura delle Mofette, &c. *Diſcourſes concerning the Nature of Damps, by* Leonardus Capuanus, *a Member of the Academy of the* Inveſtigantes. *Naples, in* 4^to. 1683.

IN the Preface to this Treatiſe, the Son, who is the Publiſher thereof, gives us the Hiſtory of the Beginning and Fate of the Academy of the *Inveſtigantes*, whereof his Father, the Author of this Book, was one, in ſhort, thus: Marqueſs *Andreas Concubletti*, after the Example of the *Royal* and *Florentine* Societies, invited the Learned Men of *Naples* to meet on certain days at his Houſe to Diſcourſe of and to Cultivate Learning and Knowledge; theſe aſſumed the Name of *Inveſtigantes*, with an Hound for their Impreſs, and *Lucretius*'s word, *Veſtigia luſtrat*, for their Motto. Scarce had this Society met four or five times, from which ſome promiſed themſelves great Matters, but it was again broken in pieces, by the removal of the chief Perſon under whoſe Protection they met. It was more than Twenty Years before this Piece, containing ſome of the Lectures made in that Aſſembly, were publiſh'd in Memory of the being of ſuch a Society, and Dedicated to the Queen of *Sweden*. In the firſt of theſe the Author enumerates the chief Places that formerly, or at this day exhale a noxious Vapour, treating largely of the Caves and Lakes near *Naples*, *Puzzuoli*, *Baiæ*, and *Cumæ*, making the Lake *Avernus* differ from theſe Damps, in that it is miſchievous only to Birds, whereas the other are ſo to all Creatures. Next, he gives the Opinions of the Old and New Philoſophers concerning the cauſes of theſe Damps. In the *Second Lecture*, ſuppoſing Life to conſiſt in the due Fermentation of the Blood, and other Juices of the Body, he ſhews how neceſſary the Air is for the continuing of Life, both in Plants and Animals, which the former that want Lungs, do yet receive in Veſſels Analogous thereto; having ſhewn that a Vivifick *Spirit* or *Aura*, generated out of the Blood by the Brain, is the Principle of Motion in Animals; and that the dilating of the *Thorax* in breathing depends on this *Aura* only, which by the direction of the Soul is ſent into the Nerves of all the Members, ſo cauſing Reſpiration (which he makes a voluntary Action) and accompanies the Air, received by the Veſſels, to the Blood. In the *Third Lecture* he Examines the ſeveral Effects of the Caves exhaling theſe Damps, attempting to explain their cauſes, *viz.* Lighted Torches are extinguiſht by the thick and compact Mineral Exhalations which oppoſe the Particles giving or compoſing Fire, and compreſs them ſo, that they are forced to give way, and are diſſipated. That in Animals theſe Vapours riſing by little and little out of the Veins of the Earth, and united together in theſe Subterraneous Caverns, forcibly enter the Organs of Reſpiration, and either wholly conquer or drive out the Vivifick *Aura*, or at leaſt ſo contract it, and leſſen its Power, as to ſtop the Motion of the Blood, and indeed all other Motions, and Life it ſelf. That deadly Lakes kill only the Birds that fly over them, by reaſon of the Mineral ſteams that from the bottom penetrating the Water, ariſe in a thin weakned Exhalation, and Birds requiring a more refined and purer Air than other Animals, are ſooneſt affected by it. Then he Queries upon what Account *Avernus*, formerly from its deadly Quality dedicated to *Pluto*, is now ſo altered, as to have been hurtleſs both to Fiſh and Birds for a long time, and ſubſcribes to their Opinion who refer the cauſe to the burning of the adjacent *Gaurus*, now called *Barbarus*, and ſuppoſe that the Mortal Vapours formerly penetrating theſe Waters, are now burnt out. There are ſeveral Curious and Learned Particulars interſperſed in this Treatiſe relating to Natural Hiſtory, concerning ſeveral Bodies hidden in the Bowels of the Earth, nearly agreeing with thoſe daily in our view.

LONDON:

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PHILOSOPHICAL TRANSACTIONS.

For the Month of February, 169$\frac{3}{4}$.

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I. *An Account of ſome* EXPERIMENTS *lately made on Dogs, and of the Effects of Mr.* John Colbatch*'s Styptick on Humane Bodies. By Mr.* William Cowper, *Surgeon.*

THE Report of Wonderful Cures wrought by Mr. *Colbatch*'s Styptick Pouder, ſo entertained the Expectations of divers Perſons, that amongſt others I thought my ſelf obliged to obtain ſome convincing Proofs of its Operations. A large Dog being provided, an Aperture was made through the common Integuments of his *Abdomen*, whence the ſmall Guts were extruded; after an Inciſion made in one of them according to its length, they were again reduced; the Wound in the *Abdomen* being ſtitch'd up, a Solution of this Pouder was applyed; the Dog continued without any ill Symptoms, and became perfectly well in few days after.

The like Experiment I have ſince made on another Dog, who in like manner recovered without the application of any Medicine. In a few days after the firſt Experiment was made, the Leg of the ſame Dog was Amputated three Inches above the *Patella*; the expence of Blood from the Arteries was great, which did partly proceed from the unaptneſs of the Applications which were prepared; but after two or three attempts the Flux of Blood was ſtopt, and ſuch a Bandage made uſe of as was neceſſary only to keep on the Dreſſings: The Dog continued without any conſiderable Flux of Blood, and the next day he was found on his three Legs. This Experiment raiſed our Expectations of the like Succeſs on Humane Bodies: Therefore it was tryed on a Man in St. *Bartholomew's Hoſpital*, whoſe diſeaſed Arm was Amputated above the Elbow; but for above a quarter of an hour's time many ſucceſleſs Applications of this Styptick were made, and at length a ſmall Tent dipt in the Pouder it ſelf inſerted into the extremity of the Bleeding Artery, before the Flux of Blood would admit the application of Bandage. Five hours after, a freſh Flux of Blood appeared, and ſtrict Bandage was applyed. The ſame Morning the above-mentioned Amputation was made, a Boy about Twelve or Fourteen Years of Age had his Leg alſo taken off below the Knee, to whoſe Stump divers ſucceſleſs Applications of this Styptick were alſo made, before it was bound up, and in leſs than an hour after, a freſh Flux of Blood happened, and ſtrict Bandage was added. Some hours after theſe Operations, both theſe Patients ſuffered extravagant Pains: Three days after, the Applications were taken off, and had any Perſon, a ſtranger to what had been done, ſeen the Stumps, he would have ſuppoſed nothing leſs than an actual Cautery had been applyed, or could have occaſioned ſuch large Eſcars, and ſo horrid an Appearance; which did ſufficiently denote this *Vulnerary Pouder* (as it's called in a late Publick Paper) to be a violent Cauſtick. The *Pouder* was applyed with all imaginable fairneſs, and in the Preſence of the Inventer, who I think has no Reaſon to imagine thoſe *Surgeons* who made uſe of it in the Hoſpital, had any Deſign to prevent its Succeſs, ſince it's well known *They* were rather Prejudiced in its Favour, than on the contrary.

Tryals of *Stypticks* on the Bodies of *Quadrupedes* have been commonly practiſed to recommend *Them* to the Publick; but it is not without cauſe that Pretenders to ſuch Remedies have made choice of younger Animals, as Dogs and Calves, *&c.* for that purpoſe. But ſince the only Standard of their uſe is their Succeſs on the Humane Body, we ought to make our Experiments on thoſe Animals whoſe Magnitude and Age bear a Proportion to it: For, nothing is more obvious in Wounding the Arteries of Living Animals, than that the Protruſion of their Blood bears a Proportion to their Bulk: And in Diſſection, the Arteries of the *Fœtus* are remarkably thinner than thoſe of an Adult; and thoſe of Aged Bodies grow ſtill thicker, and frequently become Cartilaginous, and at length entirely Bony; of which Dr. *Tyſon* and my ſelf have ſeveral Pieces.

II. *Part of a Letter from Mr.* Edward Floyd, Cim. Aſhm. Oxon. *To Dr.* M. Liſter, *giving an Account of* Locuſts *lately obſerved in* Wales.

SIR,

YOU have probably been already informed from ſome other Parts of the Kingdom, of ſwarms of *Locuſts* that have lately appeared on our *Britiſh* Coaſts. However becauſe I am not certain that they have been obſerved elſewhere, I ſhall take this Occaſion of giving you what Account I can at preſent, of ſome that have been ſeen in *Wales*. As far as I have been yet informed, they were firſt ſeen on the 20*th*. of *October*, ſcattered about the Fields in *Martbery* Pariſh, *Pembrokeſhire*, where they were generally taken notice of, at firſt, becauſe of the unſeaſonableneſs of the time for Graſhoppers; but afterwards, for that upon further Examination, they found them diſtinct from our *Engliſh* Graſhoppers, in bigneſs, colour, *&c.* I could not learn that any of them have been ſeen flying in that Country; but from *North Wales* I am informed that two vaſt ſwarms of them had been ſeen in the Air not far from *Dôl-gelheu*, a Market-Town of *Merionydh ſhire*. I cannot aſſure you of the time when theſe flying *Locuſts* were obſerved, but by the date of my Friend's Letter, *&c.* I gueſs that it was near the ſame time that thoſe others of *Pembroke-ſhire* had been taken notice of in the Fields. What part of the World theſe Creatures ſhould come from, I muſt leave to your Conjecture; in the mean time I can aſſure you that they are of the very ſame *Species* with ſome *African Locuſts* in my Cuſtody in the *Muſeum*; for which (and many other valuable Curioſities) we are obliged to that very Inquiſitive and Ingenious Gentleman, Mr. *J. Aubrey*, S. R. S. who received them ſome Years ſince from *Tangier*. As yet I have but one ſent me out of *Wales*, which you may Command if you pleaſe, for I expect ſhortly more of them.

This Pilgrim-Locuſt I call, *Locuſta erratica, alis ichthyocollæ adinſtar pellucidis, reticulatis maculis conſperſis.* It is in length (from the Head to the tips of the Wings) three Inches and ¼, of a reddiſh colour all over, except the Wings. As to the Head and *Caputium*, it reſembles the Fourth Figure of *Mouſetus*. The Eyes are prominent and very large, ſomewhat of the form and bigneſs of Gromwel-ſeeds, of a reddiſh colour, elegantly ſtreaked. The *Antennæ* are broken ſo that I can ſay nothing of the length of them: They are about the bigneſs of a Hog's briſtle, and curiouſly *geniculated.* As to the Legs, the firſt pair are not quite an Inch long; the ſecond, ſomewhat above that length; but the third two Inches and ¼. Theſe hind-legs are very beautiful; for the Thighs are hexangular, and elegantly ſcaled on the outſide, with a black Liſt extended lengthways through the midſt of them. The ſhanks are of a lively red colour, adorned on the hind-part with two orders of ſmall ſharp prickles, placed not oppoſite to each others, but alternately. The Wings are about three Inches long, reſembling very much thoſe of the larger *Libellæ*, or Dragon-flies, but all over garniſhed (the outer Wings at leaſt) with reticulated black ſpots.

I ſee not much reaſon to doubt but that theſe are the very ſame *Species* of Locuſts, ſo Famous in Hiſtory for their wandring over, and depopulating whole Regions.

In *Pliny*, *Lib. xi. c. xxix.* we find theſe words, ---*Solémque obumbrant ſolicitè ſpectantibus populis ne ſuas operiant terras. Sufficiunt quippe vires; & tanquam parum ſit maria tranſiſſe, immenſos tractus permeant, diraque meſſibus contegunt nube, multa contactu adurentes: Omnia* *vero morſu erodentes, & fores quoque tectorum. Italiam ex Africa maximè coortæ, infeſtunt, ſæpe populo ad Sibyllina coacto remedia confugere, inopiæ metu.* Now whether this *multa contactu adurentes* makes any thing for the firing of the Hay-ricks I queſtion. For I ſhould be apt to underſtand thoſe words, as if they meant only *Exarefaction*, and perhaps Poyſoning, not down-right Firing or *Combuſtion.* See the following Letter, *Numb.* 4.

Julius Obſequens in libro prodigiorum, p. 69. Edit. Baſ. 1599. *Locuſtarum ingentia agmina in Africa, quæ à vento in mari dejectæ, fluctibuſque ejectæ, odore intolerabili Cyrenis mortifero vapore gravem peſtilentiam fecerunt pecori, hominúmque* DCCC *millia conſumpta tabe, proditum eſt.*

I was ſuſpicious of this at the very firſt reading of Mr. *Jones* his Letter, and therefore writ to him the very ſame day I writ to you and Mr. *Ray*, to examine the Sea *Algæ* and *Fuci* for dead *Locuſts.*

The like Account alſo *Mouf.* cites out of *Otho Friſingenſis. — Tandem verò in Mare Britannicum ſublatæ ventorum vi, fluctibus obruebantur. Sed æſtu Oceani in litus rejectæ aërem infecerunt, peſtémque anteactâ fame non minùs ſævam intulerunt.* And which comes nearer to our purpoſe, in *Mouf.* p. 123. *Poſtea per Germaniam errantes ad Mediolanenſem uſque agrum iter ceperunt, eoque depaſto in Poloniam & Sileſiam revertebantur. Tandem Menſe* Novembri (*tam diu enim vixerant*) *ut frigoris vi tabefactæ maximum fætorem excitarunt, & niſi ſuibus apriſque Sylveſtribus pabulo fuiſſent, non minus peſte graviſſimâ quàm fame tam Germanos quam Itatos affeciſſet.* But in *Wales* there are no Creatures to devour them, unleſs the Badgers and Crows may take off ſome.

III. *The*

III. *The Extract of another Letter to the ſame Purpoſe.*

Oxford, Feb. 20. 169¾.

Honoured S I R,

I Here ſend you a Note out of a MS. Entituled, *The Hiſtory of Pembroke-ſhire.* 'Twas written about the Year 1603. by one Mr. *George Owen,* a Gentleman of that Country, who ſeems to have been a Perſon of conſiderable Accuracy and Veracity.

Lib. I. Cap. 26. ‘About the beginning of *June,* in the Year 1601. a piece of Ground to the quantity of 200 *Engliſh* Acres, was covered ſuddenly (as if the ſame had fallen in a ſhower out of the Air) with a kind of Caterpillars or green Worms, having many Legs, and bare without Hair. They were found in ſuch abundance, that a Man treading on the ground, ſhould tread upon 20 or 30 of them; and in this ſort they continued for the ſpace of three Weeks or more, no Man knowing how they came, nor any of the like ſort were ever ſeen in the Country before, nor ſince; and being opened, there was nothing found within them but Graſs. The place was on a Hill in the Pariſh of *Maen clochog* above *Hynnon Dhewi.* They were found as it were with one accord to go one way, *viz.* up the Hill, and went over the Hill a quarter of a Mile and more. As they went they devoured and conſumed the Graſs, that the Ground appeared bare and red like Fallow. And after they had continued there three Weeks, there reſorted thither an infinite number of Sea-Mews and Crows, as if all of many Countries had been ſummon'd thither, who in few days conſumed them all. Alſo Swine fed upon theſe Worms eagerly, and waxed very fat, *&c.*

IV. *An Account of the Burning of ſeveral Hay-Ricks by a Fiery Exhalation or Damp: And of the Infectious Quality of the Graſs of ſeveral Grounds. From the ſame Ingenious Perſon.*

SIR,

I Received this laſt Poſt from my worthily eſteemed Friend Mr. *Maurice Jones*, Rector of *Dôl-Gelheu*, the following Account of the burning of ſeveral Ricks of Hay and Houſes, and alſo the Poyſoning of the Graſs, ſo as to render it Mortal to the Cattle that feed upon it, by a kindled Exhalation, or *Ignis Fatuus*. Be pleaſed to take it in his own words:

'This Letter contains no Anſwer to your Queries a-'bout the Locuſts, for I am wholly intent at preſent 'upon giving you the beſt Account I can of a moſt 'Diſmal and Prodigious Accident at *Hartech* in this 'County the beginning of theſe Holy-days. It is of 'the unaccountable firing of Sixteen Ricks of Hay, and 'two Barns, whereof one was full of Corn, the other 'of Hay. I call it *unaccountable*, becauſe 'tis evident 'they were not burnt by common Fire, but by a kind-'led Exhalation, which was often ſeen to come from 'the Sea. Of the duration whereof I cannot at pre-'ſent give you any certain Account, but am ſatisfied it 'laſted at leaſt a Fortnight or three Weeks; and annoy'd 'the Country as well by Poyſoning their Graſs as Firing 'the Hay, for the ſpace of a Mile, or thereabouts. Such 'as have ſeen the Fire, ſay, 'twas a blew weak Flame,

‘ eaſily extinguiſh'd, and that it did not the leaſt harm to any of the Men who interpoſed their Endeavours to ſave the Hay, though they ventured (perceiving it different from common Fire) not only cloſe to it, but ſometimes into it. All the Damage ſuſtained happen'd conſtantly in the Night. I have encloſed a Catalogue of ſuch as I have received certain Information of; and have nothing to add, but that there are three ſmall Tenements in the ſame Neighbour-hood (called *Tydhin Siôn Wyn*) whereof the Graſs is ſo infected, that it abſolutely kills all manner of Cattle that feed upon it. The Graſs has been Infectious theſe three Years, but not throughly Fatal till this laſt. Pray ſend me with all convenient ſpeed your Friends Thoughts and your own, of the Cauſes, and if poſſible, alſo the Remedy of this Surprizing *Phænomenon*, &c.

Dôl-Gelheu,
Jan. 20*th.* 169¾.

Decemb. 24th. 1693. *Richard Griffith* of *Lechwedh-du, Humphrey Owen* of *Garreg-wenn*, and *Richard Davydh* of *Erw-wenn,* each of theſe loſt a Rick of Hay the 24*th.* at Night.

Decemb. 27th. 1693. That Night was burnt one Rick of Hay of *John Philips* of *Tnys-Lanvihangel y Traethau*, two Ricks of Hay of *Griffith John Owen* of *Cefn-Trevor-bâch*, and *Katherine William,* Widdow, of *Cefn-Trevor-fvawr,* loſt two Ricks.

Decemb. 29th. 1693. That Night *Francis Evans* of *Glas-vryn* had one Rick burnt. *Richard Davydh* of *Erw-wen,* predict. had a Barn-full of Hay of three Bayles of Buildings burnt down to the Ground.

V. *Part*

V. *Part of a Letter to Dr.* Clopton Havers, *S.R.S. giving an Account of an extraordinary* Hæmorrhagia *at the* Glandula Lachrymalis.

S I R,

SInce my coming to this place I have met with a very ſtrange Caſe. An Icterical diſcontented Woman having a deſire to dye, wholly rejected the help of Medicine, and within three Months being well nigh her end, there happened an Eruption of Blood out of the *Glandula Lachrymalis* of one of her Eyes, without any External Injury: There was an Evacuation of ℔ij. of Blood within the ſpace of Thirty Hours. About a Week after the ſame Sluce was opened again, and ſhe bled till ſhe dyed. Now, I would fain know what Blood-Veſſels come to that Gland, from which ſuch a vaſt quantity of Blood ſhould be caſt forth in ſo ſhort a time.

VI. *A Letter from* Richard Townley, *of* Townley *in* Lancaſhire, *Eſq*; *containing Obſervations on the* Quantity of Rain *falling Monthly, for ſeveral Years ſucceſſively: Communicated to the* Royal Society.

Townley, *Jan.* 9. 169$\frac{3}{4}$.

S I R,

I Have now compleated this laſt Year's Obſervations, which I was very deſirous ſhould accompany the others I now alſo ſend you; and I hope you will be pleaſed upon that ſcore to Pardon my delay in obeying your Commands: I wiſh they had been more exactly made, and ſhould have been ſo, had they been intended for any thing but my own Satisfaction, and enabling me to give ſome conjecture at the Proportion of Rain that falls in this County, with that at *London*, and in other Parts of this Kingdom. But in this I have not yet attained my deſired end, not having heard of the like made in any Part of *England*; though a Friend or two had promiſed to undertake and afford me an Account of their Obſervations; but it may be they did not think it worth their while, or that it would prove more troubleſome than I have found it: For I only fixed a round Tunnel of 12 Inches Diameter to a leaden Pipe, which could admit of no Water, but what came through the Tunnel, by reaſon of a part ſoder'd to the Tunnel it ſelf, which went over the Pipe, and ſerved alſo to fix it to it, as well as to keep out any wet that in Stormy Weather might beat againſt the under part of the Tunnel, which was ſo placed, that there was no building near it that would give occaſion to ſuſpect that it did not receive its due proportion of Rain that fell through the Pipe ſome Nine Yards Perpendicularly, and then was bent into a Window near my Chamber, under which convenient Veſſels were placed to receive what fell into the Tunnel; which I meaſured by a Cylindrical Glaſs at a certain mark, containing juſt a Pound, or 12 Ounces *Troy*, and had marks for ſmaller parts alſo. I prefer'd this way of finding the Content of my Veſſel for meaſuring the Water before any other, or Gaging of ſmall Cubical or Cylindrical ones; where an inconſiderable and almoſt indiſcernible Error in the Dimenſions will prove much greater in the Content; whereas in the other way, provided the Cylinder it ſelf be ſmall, or have a very ſmall Neck at the marked place for a Pound, one may eaſily come to as great exactneſs as may be wiſhed. By the help of this Cylindrical Glaſs I thus kept my Account of what Rain fell, and generally twice or thrice a day; when I took ſeveral other Obſervations, both of the Thermometer, Barometer, Winds, &c. what Rain I found in the Receivers, if not more than made what was left in the Cylindrical Glaſs a full pound, I again left in it; but if there was more than that quantity, I filled it juſt to the Pound mark, which I threw away, and did the like with the remaining Water, as often as it would allow, ſtill keeping an Account chiefly of the Pounds thrown away, and noting alſo the parts of a Pound remaining in the Glaſs; by the help of which latter, and the parts remaining at any time before, by numbring the Pounds, and ſubſtracting the Parts at the end, for Example, of one Month, from the Pounds thrown away, and the Parts remaining at the end of another, I find the quantity of Rain fallen betwixt theſe two times, and that ſo as to aſſure me that I erred no more in the quantity of Rain of another Year, than by the miſtake in the differences of the parts of a Pound in the firſt and laſt Obſervation: Whereas ſhould I ſtill write down the Rain that falls between two Obſervations, I might be ſubject to make as great a miſtake in every one of them, and conſequently be much more uncertain of the quantity of Rain fallen in many of thoſe added together: Beſides this Addition is longer in performing, and giving the quantity ſought, than the Method I make uſe of. I have added theſe Particulars to ſhew you how little trouble there is in this Task; which therefore I hope ſome of your Ingenious Friends may be perſwaded to undertake, and then by continuing my own Obſervations, I may be further ſatisfied, than hitherto I have been with them: For all I have yet learnt as to the main Point, is, that here we have almoſt juſt twice the quantity of Rain that falls at *Paris*. This County, and particularly that part of it where I live, being generally eſteemed to have much more Rain than other Parts, and in a greater proportion than I thought reaſonable to be allowed; however it be, yet by what I have ſent you, 'twould be unjuſt, without further Obſervations of the like Nature in other Parts, that all *England* ſhould be eſteemed to abound as much in Rain as theſe Parts do: Where by reaſon of the very high Grounds in *Yorkſhire*, and the Eaſtern Parts of *Lancaſhire*, the Clouds driven hither by the S. and S. W. the general Winds in this Part of the World, are oftner ſtopt and broken and fall upon us, than ſuch as come by an E. or S. E. Wind, which broken by the Hills, are generally ſpent there, and then little affect us; and this is the reaſon that *Lancaſhire* has often conſiderably more Rain than *Yorkſhire*.

The above-mentioned Method of Eſtimating Rain by Pounds, to thoſe of my Family, gave a ſufficient Idea of the Proportions of the falling Rains, and the wetneſs of the different Seaſons, though they knew not how high it would raiſe the Water in a Cylinder equal, at the bottom, to my Tunnel; but to inform others of this with little trouble, in the Table I have ſent you, the Pounds and Parts are doubled, and theſe I have rather ſent you, than thoſe of the whole Pounds; ſince the ſame gives both the quantity of half Pounds, and the height in Inches, according to the general way of Eſtimating the quantity of Rain, only with this difference; that for the half Pounds only the laſt Figure is a Decimal Fraction, and the other the number of the half Pounds; and for the Height the two laſt Figures denote the Decimal Fraction of an Inch, and the remainder the height in Inches, ſo near the truth, that they only fall ſhort of it one Inch in 200, which defect is eaſily ſupplyed. To this I need only add, that the Numbers on the right hand are the Sums of all thoſe in the ſame Line, that is in the firſt part of ſeveral Numbers for Ten Years; ſo that the laſt of them ſhews the Sum both of the half Ounces that have fallen during that ſpace of time, and the height the Water would have been raiſed in that time alſo. To this I ſhall only add one Example: The Sum of all the Rain in the Ten firſt Years 41227, and therefore according to what hath been ſaid, 4122[7 is the number of half Pounds that fell in compaſs of the Tunnel during thoſe Ten Years; and 412[27 the height it would have raiſed the Water during that time. But if you deſire to be more critical, if you add 2[06 its 200th. part, you will have 414[33 for the true height, and 41[413 for the mean height by thoſe Ten Years Obſervations; and 412[27 for the mean quantity of half Pounds. By the ſame Method you will have the means for the other Five, *viz.* of height 41[78, and 417[8 for the mean number of half Pounds, which means do ſtrangely agree, and both conſidered do give for the mean by all the Fifteen Years 41[516 Inches in height, which is about $\frac{3}{4}$ of an Inch more than double to that raiſed by the Water at *Paris*, which as ſet down in the Memoirs for the Ingenious, for *February* laſt, is ſtated about $19\frac{1}{2}$ *French* Inches, which make 21 *Engliſh*. I have omitted the Account of the Years 87 and 88, which I found faulty, by reaſon the Perſon (who had the charge of noting what Rain fell during my abſence ſeveral times then from home) did not punctually obſerve the uſual Method I had preſcribed him. I forgot when I mentioned my way of Gauging by Weight, that it was grounded upon 22[7368 Cubical Inches of Rain-water, being equal in weight to one Pound, or 12 Ounces *Troy*; ſo that dividing any Superficies in Inches of a Veſſel for receiving the Rain-water by the before mentioned Number, it will give you the Pounds and Parts that will raiſe the Water upon that Superficies, with upright ſides, juſt an Inch: And thus I found that 4[974 Pounds would fill a Cylinder equal at the bottom to my

Tunnel, and one Inch high, which you ſee is very near five Pound, which you will alſo find will only raiſe the Cylinder higher by $\frac{1}{200}$th. part. But now I have detain'd you ſo long, and I am afraid needleſly; ſo that I truſt to your Goodneſs for Pardon in this, and what elſe you ſhall here find amiſs upon the ſcore of my Eyes, which oblige me to truſt more to others, than otherwiſe I ſhould. I am

Your moſt Humble Servant,

Rich. Townley.

P. S. In a late Poſthumous Book of Mr. *Boyle's*, I find an Account of ſome of my Obſervations of the Barometer, without any hint of the Uſe intended to be made of them, which make them ſeem to be very odly brought in: All that I can remember, is, that he was pleaſed to lay his Commands upon me, to ſend him an Account of the ſeveral times that I had found the *Mercury* above or near 30 Inches high, or not much above 29 during the time he mentioned: But I know not whether I did hint to him, or indeed did then really know my ſelf the great Harmony betwixt the *Mercurial* Standards at *London* and here at *Townley*: For by a whole Month's Obſervations, Mr. *Flamſtead* was pleaſed to ſend me, the *Mercury* ſtill roſe and fell both there and here exactly at the ſame time; I always found it rather more than $\frac{3}{10}$ of an Inch lower here than at *London*, by reaſon that we are ſeated though in a ſeeming Valley, in reſpect of the Neighbouring Grounds, yet we are conſiderably higher than the other low Lands near the Sea, where the Standard differs little from that at *London*. I ſhould be very glad to know whether the like Agreement has been obſerved in *France*, or other remoter Parts, betwixt their height of the *Mercury* and that at *London:* You would alſo Oblige me in procuring me ſome Obſervations of the Barometer, made this laſt Year at *London*, where there was ſo much Rain for the moſt part of the Summer, and here ſo little; as you will find by the Paper I have ſent you, and ſo great a Drought, that we have not above half the Proportion of Hay that leſs dry Summers uſed to afford us; for if ſometimes the different heights of the *Mercurial* Standards vary much, probably 'twas about that time; though I am enclined they do not alter, except it be in very hot and cold Weather, when the weight of the ſame Cylinder of Air may much vary in its weight, as well as rarity and denſity: But in confirmation of what I have ſaid above, I ſuppoſe you may not be diſpleaſed with two Remarkable Obſervations, made both by Mr. *Flamſtead* and me at the ſame time, *viz. Novemb.* 18*th.* 1674. when finding the *Mercury* to deſcend both very faſt and very low, we watch'd it very nicely, and both of us obſerved that at Two in the Afternoon it was rather falling, and rather riſing at Four; at which times the height was only here 27[63 Inches, and at *London* $\frac{3}{10}$ths higher.

The TABLE of Rain.

	1677	78	79	80	81	82	83	84	85	86	Sum
Jan.	472	371	043	512	053	906	238	032	110	472	3289
Febr.	270	371	161	492	363	135	245	483	042	020	2582
March	245	250	202	413	235	237	305	087	185	572	2731
April	325	170	092	222	057	308	402	370	380	305	2631
May	313	581	105	188	069	315	353	097	201	437	2659
June	516	257	298	342	397	517	468	192	410	473	3870
July	351	339	350	302	292	482	412	313	497	188	3526
Aug.	485	145	835	502	425	385	582	338	398	870	4965
Sept.	223	527	553	146	607	293	152	199	163	572	3435
Octob.	333	644	616	570	170	427	330	425	325	293	4133
Nov.	432	555	127	479	235	525	192	579	522	709	4355
Dec.	400	057	439	269	423	456	037	299	548	132	3051
Sum	4365	4267	3821	4428	3326	5066	3716	3414	3781	5043	41227

	1687	88	89	90	91	92	93	Sum
Jan.			333	707	197	054	218	1509
Febr.			393	171	112	168	078	922
March			875	145	476	342	298	2136
April			468	078	386	498	539	1969
May			182	244	300	330	093	1149
June			302	179	412	416	181	1490
July			120	218	285	448	112	1183
Aug.			222	402	193	198	668	1683
Sept.			442	403	215	605	641	2306
Octob.			740	765	165	273	514	2457
Nov.			415	717	230	148	627	2137
Dec.			368	262	169	892	261	1952
Sum			4860	4291	3140	4372	4230	20893

An Account of an Accurate Experiment of the Quantity of Vapour compared with this of the Rain, with ſeveral Obſervations thereon, is intended to be part of one of the next Tranſactions.

VII. Hiſtoria Lumbaginis Rheumaticæ Convulſivæ, à *Roberto Pitt*, M. D. & S. R. S. Communicata.

VIR erat quaſi 35 Annorum, robuſtus Temperamenti Bilioſi, qui Decimis colligendis eo tempore occupatus, poſt Operam laboroſiorem poros forſan cito nimis ex rigore admiſſo occluſerat.

Primâ ergo Morbi Invaſione febricitavit, primo, rigore & Horrore, dein Calore, & Doloribus vagis, (nunc in Ventriculo & Inteſtinis, mox in Pectore ſævientibus) correptus: Verùm hæc Symptomata cum aliis brevi permutantur. Materia enim Morbum committens ſe in Dorſo omnem depoſuit; hinc immanis Lumborum Dolor ad Cox-

endicem uſque ſæviens. Et quidem tantus erat Dolor, ut Sudores Symptomaticos ſic expreſſerit, ut à Capillis & Facie guttæ catervatim ſtillarent. Præ Dolore neque in lecto procumbere nec erectus ſtare, nec in ſedili ſedere potuit: Verum Abdomine ad ſpondam pedum fulcris protruſo, Dolorem Lumborum compreſſione illâ aliquo modo fallere videbatur. Sed neque ſic inclinato corpore, quietus (ut voluit) perſtare uſque potuit: Sed Convulſionibus correptus primò erigebatur cum vultu miſerabili, & ringenti Ore, dein in humum retorquebatur (niſi adſtaret aliquis qui Caſum ejus præveniret) ubi immotus Cadaveris inſtar manebat, ſeſe movere inhabilis, neque majori ad ſurgendum potentiâ donatus, quàm ſi eſſet Infans. Brachia etiam & Crura ei proſtrato rigebant, ut nullo modo extendi retrahive poſſent. Os etiam Convulſionibus ita claudebatur, ut Cochleare vix admitteret. Convulſiones autem illæ quibus Membra & Dorſum corripiebantur, per Paroxyſmos redibant; non quidem Periodicos, ſed nunc citiùs, nunc ſeriùs redeuntes, prout Dolor magis minuſve ſæviret. Sed eum ad poſitionem ſuam optatam Spondam Sc. reducamus, ubi vultu ita erat compoſito, qui riſum ſane cuiquam videnti facilè moveret, niſi Recordatio earum quas ſuſtinebat miſeriarum, Miſerecordiam potiùs excitaret. Sic autem Dies Nocteſque Miſellus Homo tres plus minùs ſeptimanas tranſigebat, nunquam in Lecto diſcumbens inſomnis ut plurimum, cum Dolore ſummo, crebriſque Convulſionibus. Hæc ſunt quæ in eo obſervare potui Symptomata: cætera ſanus. Nulla erat Vomituritio. Pulſus fortis & æqualis. Lingua humida, & pelliculâ albâ obducta. Sanguis per Venæ ſectionem eductus, Sanguini Pleuriticorum ſimilis. Vrina ut ſanorum. Quid per primam ſeptimanam factum ſit, neſcio; niſi quod Vena ſemel pertunderetur, ſemel Clyſter, & ſemel purgans Medicamentum adminiſtrarentur, & vis ſatis magna Laudani ſine fructu exhiberetur. Sed incaſsùm hæc omnia. Tandem me accerſi curant, qui cùm Ægrum vidiſſem eo quo ſcripſi modo laborantem

rantem Venæ ſectionem repeti jubeo ad ſatis largam quantitatem. Die proximo Lenitivum præſcripſi, quod dum per ſedem ad 3. 4^{ve} vices operabatur; Æger rectus obambulare potuit, nullis doloribus, nec Convulſionibus laceſſitus: quo tandem ſuo munere perfuncto, redeunt ſtatim Dolores & Convulſiones, & ipſe ad priſtinam ſuam ſtationem Spondam ſc. redit. Hoc tamen Animos addidit, Purgationes repetitas rem ipſam expedire poſſe, cùm primum Purgans eas à Morbo inducias daret. Die ergo ſequenti Reſinam Jalapii & Mercurium dulcem exhibui (cùm expertus eſſem quid in Lumborum Dolore valeret hoc Medicamentum) ſed præter ſpem, ne ſemel quidem depoſuit Æger, quanquam ℥j. Syr. e Spin. Cervinâ adjecerim. Ut ergo duro huic Nodo, durum ſatis adaptarem Cuneum, Purgantium Doſin auxi, Syr. e Spin. Cervin. ad ℥iij. $℥iiij^{ve}$ alternis diebus adhibens. Sic tandem Alvus aperta eſt, & Dolores mitigari, & Convulſiones non ita crebro laceſſere. Serum Lactis, ut ad libitum hauriret, permiſi. Et cùm Alvus purgantibus reſponderet, Laudanum tutiùs & liberiùs exhibere potui, unde Requiem Spiritibus à Morbo ſimul & Medicamentis exagitatis conciliarem, nec tamen materiam Morbum committentem ab eo incarcerarem. Sic tandem factum eſt ut à repetitis his Purgantibus, octo puto, aut decem, evanuit Dolor, & convulſiones ceſsârunt, & ipſe ſartus tectus valet. Ego interim ut à Recidivâ caverem, Nervina Medicamenta, quæ Sanguini & Spiritibus vigorem imprimerent, adhibens; Eum vegetum vividumque & Onera Humeris ſuſtinentem, nuper vidi. E memoriâ fere excidebat, ſuras ei convaleſcenti intumuiſſe, qui tumor his ultimis Medicamentis facilè ceſſit. Suadebam ego frequentiorem Venæ-ſectionem, ſed cum Ruſticis idem ſonat, Sanguinem & Vitam ipſam effundere. Sed æquè feliciter mihi ceſſerunt Purgantia repetita.

VIII. *An Account of a prodigiouſly large Feather of the Bird* Cuntur, *brought from* Chili, *and ſuppoſed to be a kind of Vultur*; *and of the* Coffee-Shrub. *By* Hans Sloane, *M.D. S.R.S.*

THE Magnitude aſcribed to the *Cuntur* of *Peru*, as well as its great force and ſtrength, have been the cauſe that many have doubted its Being. Capt. *John Strong*, Commander of a Ship which went into the South Seas, through the Straights of *Magellan*, and returned after 23 Months Voyage in the Year 1691. gave me this Account, together with a Wing or Quill-Feather of the Bird: That on the Coaſt of *Chili* they had met with this Bird in about 33°. S. Lat. not far from *Mocha*, an Iſland in the South Seas, and before they came at a place called *Herradura*: That his Men were very much amazed at the bigneſs of it, and that after they had killed it, it was 16 Foot from Wing to Wing extended. The *Spaniſh* Inhabitants there told them, it was the *Cuntur*, and that they were afraid of theſe Birds, leſt they ſhould Prey on, or injure their Children. The Feather he gave me is 2 Foot 4 Inches long, the Quill-part is 5 Inches ¾ long, an Inch and ½ about in the largeſt part, which is of about ½ Inch Diameter; it weighed 3 Drams 17 Grains and ½, and was of a dark brown colour, very hollow or concave on one ſide, and convex on the other. The Seamen ſhot it ſitting on a Cliff by the Sea-ſide, and eat it, not being very nice, and taking it for a ſort of Turkey, which I ſuppoſe they did on ſome ſimilitude there was between this and Turkeys; in which miſtake likewiſe the firſt comers to *Jamaica* were with a Bird in that place, called a Carrion-Crow, which is a ſort of Vultur, of which kind I believe this is. But leſt this ſhould appear Romantick, it will not be amiſs to ſet down the words of *Joſeph Acoſta* and *Ynca Garcilaſſo de la Vega* about it, omitting thoſe of *Delaet Ind. Occidental. Lib.* X. *Cap.* 5. being only copied from the former.

Contrariwiſe (*to the Humming-Birds, or Tomineios, of which he was ſpeaking*) thoſe which they call *Condores*, be of an exceeding greatneſs, and of ſuch a force, that not only they will will open a Sheep and eat it, but alſo a whole Calf. *Joſeph Acoſta, Natural and Moral Hiſtory of the Indies,* lib. 4. cap. 37.

There are other Fowls which we may reckon with thoſe of Prey, which are of a large ſize, called *Cuntur*, and by the *Spaniards* corruptedly *Condor.* Many of theſe Fowls having been killed by the *Spaniards*, had their Proportion taken, and from one point of their Wing to the other meaſured 15 or 16 Foot, which being reduced to Yards, makes 5 Yards and a Third. Nature to temper and allay their Fierceneſs, denied them the Talons which are given to the Eagle, having their Feet tipped with Claws like a Hen; howſoever their Beak is ſtrong enough to tear off the Hide, and rip up the Bowels of an Ox. Two of them will attempt a Cow or Bull, and devour him; and it hath often happened that one of them alone hath aſſaulted Boys of Ten or Twelve Years of Age, and eaten them. Their colour is black and white like a Magpye; it is well that they are but few in number, for if they were many, they would very much deſtroy the Cattel. They have on the fore-part of their Heads a Comb, not pointed like that of a Cock, but rather even in the form of a Razor. When they come to alight from the Air, they make ſuch a humming noiſe with the fluttering of their Wings, as is enough to aſtoniſh or make a Man deaf.

Inca Garcilaſſo de la Vega Royal Comm. Tom. 1. *Lib.* 8. *Cap.* 19.

The Figure, Deſcription, and Account of the Coffee-Shrub which are hitherto publiſhed, being in ſome Particulars defective, it was thought convenient to have them mended, by giving a Figure and Deſcription of it, taken from a dryed Branch brought from *Moha* in *Arabia Fœlix* by Mr. *Edward Clyve*, who as he was the firſt who has brought any of its Branches and Leaves into theſe Parts, he very frankly gave leave to take a Figure of it, and likewiſe imparted the other Particulars in this ſhort Account to Oblige the Curious in theſe Matters.

This Branch, which was taken off a Tree ſeven or eight Foot high, is about five Foot long, and covered with a gray almoſt ſmooth Bark: The Wood is white, and the Pith not very large; the Twigs are covered with a darker colour'd very ſmooth Bark, and ariſe oppoſite to one another by pairs, ſtanding croſs to one another, coming out of oppoſite ſides of the Branch, or the two pairs next to one another, cutting each other at right Angles. After the ſame manner ſtand the Leaves on the Twigs, as the Twigs on the Branches, at ſometimes an Inch, and ſometimes two Inches diſtance each pair of Leaves from the other: The Leaves have ¼ Inch foot-ſtalks, being about four Inches long, and two broad in the middle where broadeſt; whence they decreaſe to both extreams, ending in a point. They are ſmooth, whole, and without any inciſures on their edges, ſomewhat like the Leaves of a Bay. The Fruit comes *ex alis foliorum* hanging or ſticking to the Twig by ½ Inch long ſtrings or foot-ſtalks, and ſometimes 1, 2, or more at the ſame place. For the Fruit and outward Husk, &c. they are already well deſcribed by others, only it will not be amiſs to give this further Account of theſe Shrubs. That they are Planted in *Arabia Fœlix*, called *Jaman*, every where in a Rich Ground or Mold in great plenty, and that they are watered in times of Drought as other cultivated Vegetables there by Artificial Channels from Rivers cut on purpoſe to nouriſh them; and that after 3, 4, or more years bearing, the Inhabitants are forced to Plant new Shrubs, becauſe the old ones become not ſo Fruitful after that time. It is likewiſe worth taking notice, that in thoſe Parts they dry them in the Sun, and afterwards take off the outward Husk of the Berries by means of Hand-Mills, as they do here the Husks of ſeveral ſorts of Grain, to fit them for uſe; and that the *Arabians* themſelves in Summer heats uſe theſe Husks roſted after the manner of Coffee-berries, eſteeming that Drink more cooling, it being ſouriſh to the taſte.

A. A. *Repreſents the Shrub, wherein is obſervable the manner of its branching, and of the growing of the Leaves and Fruit.*

a. a. a. a. *The Fruit growing 2, 3, or more at a place on the Twigs.*

B. *One of the Leaves of the Natural bigneſs.*

C. C. *The Fruit of the true ſize and figure.*

c. c. *The Fruit with the Husk on.*

e. e. *The Fruit with the outward Husk taken off.*

i. i. *The Berry with both the Husks off.*

An

An Account of BOOKS.

I. *Martini Liſter, Exercitatio Anatomica in qua de Cochleis, maximè Terreſtribus, & Limacibus agitur. Omnium diſſectiones tabulis æneis, ad ipſas res affabre inciſis, illuſtrantur. Cui accedunt Digreſſiones de Reſpiratione, Generatione Androgynâ, Sæpiâ, Loligine, & Polypo aliiſque rebus naturalibus. Sumptibus* Sam. Smith, & Benj. Walford, *Societatis Regiæ Typographorum, ad Inſignia Principis, in Cœmeterio D. Pauli.* 1694. Octavo.

THE Author gives ſome Reaſons why he fell ſo late upon this ſort of Anatomy, which the Reader may ſee in the Preface.

You have here diſſected about Ten Species of Animals; ſix of which are Land-Snails, and four or five naked Snails, all of this laſt ſort which this Iſland affords. In this Comparative Anatomy, you have the *biggeſt* of our Land-Snails, known by the name of *Pomatia Geſneri*, diſſected, for an Example to the reſt.

The outward parts of Snails are firſt deſcribed; as the Skin, Horns, and the Eyes therein placed, the Head and Foot. Alſo the ſeveral openings and inlets to the Body. As, for the Mouth, for the *Anus* near it, for the *double Genitals*, &c.

The *Gills* and vaſt Cavity covering the Back, where the *Heart* alſo is placed. Here is alſo a ſort of Hypotheſis about Reſpiration offered. The *Guts* are alſo, with much accuracy, deſcribed; and that Parenchymatous part, called by the Greeks *Meconium* (ſee there alſo the Reaſon of that Name) aſſerted to be no Liver, but certain Appendicules or Ramifications of the ſmall Guts.

The Vital Juice of Snails, circulated by the Heart in the Arteries and Veins, is ever liquid and thin, and ſo remains in the Cup after emiſſion by Inciſion, yet eaſily coagulating by Fire, in like manner as the *Serum* of our Blood.

But the moſt Remarkable thing in this ſort of Animals are the double Genitals, each Animal being both Male and Female. The firſt Obſervation of the thing is owing to the Learned Mr. *Ray*. The Author is very exact in the deſcription and uſes of theſe Parts; which cannot well be further inſiſted upon in the Vulgar Tongue, referring the Curious to the Book it ſelf for particular Inſtruction. He concludes this ſmall Tract with the Reaſons why Snails can live all Winter, and even many Months in the Summer without Food.

All the *Anatomic Part* is illuſtrated with Exact and Curious *Figures*, deſigned by the Life.

To conclude, if the Philoſophy pleaſes not, there is yet a *Lucriferous Project* offered to gratifie the Induſtrious, of *multiplying of Pearls*; by making Ponds for the Animals, which are apt to breed them, of Petrefying Waters, whether freſh or Salt.

II. *A*

II. *A Treatiſe of the Natural Grounds and Principles of Harmony.* *By* Will. Holder, *D. D.* &c. Lond. *in Octavo.* 1694.

IN the Introduction the Reverend Author Obſerves, that Sounds, the material part of Harmony, are Natural and Phyſical; but the diſpoſing of them ſo as to delight the Hearing, is the formal part of it; both united make Harmony compleat, and may be either in Symphony, where many ſounds are heard together, or Solitary, where the Ear finds the Agreements of ſingle preceding with ſubſequent Harmonious Notes by expectation. The Phyſical Reaſon of this pleaſing Agreement of Sounds is the deſign of this Tract. In order to which,

In the Firſt Chapter he conſiders the Nature of Sounds in general, and therein agrees with the beſt Philoſophers that Sound is made by a tremulous motion of ſome body which communicates it to the ambient Air, whence 'tis propagated in a Sphere by a Temporaneous progreſſive motion of the parts of the Air at the rate of 276 Paces in a ſecond Minute of time, which is ſometimes violent enough to break Glaſs Windows, and being reflected by reſiſting Objects makes Echoes. If the tremulous motion be uniform, it makes a Muſical Note or Sound; if difform, a Noiſe; and the Muſical Sounds are differenced by the reſpective quickneſs of their tremulous motions.

In the Second Chapter he more eſpecially conſiders Harmonious Sounds, and ſhews that the quicker tremulous motions make the Muſical Sound more acute, the ſlower, more grave. And from the proportions of theſe Motions to each other proceeds the Harmony or Diſcord of them to each other: And from the continuation of the motion the ſame as to time till it ceaſe is the cauſe of the continuance of the Tone the ſame. This Doctrine he explains by the Pendulum and other ſenſible vibrating Motions, as ſtrings or Springs: From which viſible *Phænomena* he concludes, that the Motions that cauſe Muſical Sound are of the ſame Nature, tho' they cannot be diſtinguiſht by the ſight. And in an Appendix to this Chapter he has farther explained the Doctrine, and reſolved ſome Doubts and Objections concerning it; and more particularly applies it to the explication of the tenſion, length, vibration, and velocity of Muſical ſtrings; ſhewing that as ſhorter Pendulums and ſtronger Springs make quicker Vibrations, ſo ſhorter ſtrings, and more ſtrongly tended, make acuter Notes.

In the Third Chapter he ſpeaks in general of Conſonancy and Diſſonancy, ſhewing it to be the Reſult of the Agreement or Diſagreement of the undulated Motions of the Air, which he explains by the undulations on the Surface of Water or Quick-ſilver, though he doth not inſtance in them as exact to his purpoſe, but only as Illuſtrations; to which purpoſe he alſo mentions ſome Experiments of the Agreement and Diſagreement of ſome Muſical ſounds as they are made in the Air, which are more remarkable and notorious, and do very much pleaſe, or very much offend the hearing, explaining the Reaſons of them by the ſame general Doctrine.

In the Fourth Chapter he more particularly ſhews and determines what the Harmonious Sounds which pleaſe the Ear (which is the Judge) are, and therein ſhews that the Ear approves of theſe Intervals, *i. e.* the 8th. the 5th. the 4th. then of the 3d. *major*, the 3d. *minor*, the 6th. *major*, the 6th. *minor*; and of greater Intervals compounded of theſe with an 8th. as of a 10th. which is an 8th. and a 3d. of a 12th. which is an 8th. and a 5th. of a 15th. which is an 8th. and an 8th, &c. This

Syſtem of 8, conſiſting of 7 Intervals, or 8 Notes incluſive, is called *Diapaſon,* and every Octave or Syſtem above or below it aſcends or deſcends by the ſame Intervals. Then he gives the Reaſon why they ſo pleaſe the Ear, and this he ſhews to be from the more frequent coincidence of their appropriate Vibrations. As the Uniſons unite in every Vibration being perfectly Iſochron; 8ths. every 2d. of the quicker, 5ths. every 3d. of the quicker, 4ths. every 4th. of the quicker, 3d. *majors* or *Ditons* every 5th. 3d. *minors* every 6th, &c. and two ſtrings of equal bigneſs and tenſion will give theſe Intervals, if their lengths be in proportion to one another, as 1 to 2, 2 to 3, 3 to 4, 4 to 5, and 5 to 6. Upon the occaſion of the difference of 3ds, and the difference of 6ths, he diſcourſes which of them may be more properly made uſe of in movements of Conſort-Muſick, but only in *tranſitu,* as being not pertinent to his preſent Deſign, but to avoid ambiguity of Name, he has given a Table both of the ſeveral Intervals, and alſo of the ſeveral Names of each Interval, *pag.* 66.

In the Fifth Chapter he ſpeaks ſomewhat of Proportion in general, and then of three kinds of it; Arithmetical, Geometrical, and Muſical,which he in ſhort defines and explains: Then he explains the ſeveral Denominations of Geometrical Rations, as Multiplex, Superparticular, Superpartient, &c. and then comes to ſhew how this Doctrine is uſeful and applicable to Harmony and Muſick, and that the Philoſophy thereof conſiſts in the Rations or Proportion of the Bodies, of the Motions and of the Intervals of Sound, in the very Contemplation of which there is no leſs pleaſure and ſatisfaction than in the hearing it ſelf of good Muſick: The Rations he ſhews to be found by Multiplications and Diviſions, and thereby the Progreſſions and the Mediums may alſo be eaſily reduced to be expreſſible by whole Numbers. Thus adding of Rations is performed by

Multiplying the Antecedents together, and alſo the Conſequents, and thoſe two Products give the Compound Ration, as to add 4 to 3, and 6 to 5. $4 \times 6 = 24$, and $3 \times 5 = 15$. So 24 to 15, that is, 8 to 5 is the Sum of thoſe two Rations; that is, a 3d. *minor* added to a 4th. makes a 6th. *minor*: Thus 3 to 2 added to 4 to 3 makes 2 to 1, that is, a *Diapente* added to a *Diateſſaron* makes a *Diapaſon*. So Subſtraction of Rations one from another is performed by Diviſion; that is, as Diviſion of Fractions is performed by croſs Multiplication, ſo alſo the doubling, trebling, quadrupling, &c. of Rations is performed by ſquaring, cubing, biquadrating, &c. of the terms. So the halving, triſecting, quartering, &c. is performed by extracting the Square Root, the Cubick Biquadratick Roots, &c. of the Terms, or by Croſs Multiplications, as in the dividing Fractions; by which Method he ſhews how 'twill be eaſie to find how many leſſer Rations are contained in a greater, &c. as *Merſennus* found 50½ *Comma's* in an *Octave*. But *Mercator* working by Logarithms finds 55 +. And ſuppoſing a *Comma* to be a 53d. part of a *Diapaſon*, he thereby accommodates the expreſſing of all the Intervals by *Comma*'s pretty near, of which here is (*p.* 106.) a Table added. The Ancients owned only 8th. 5th. and 4th. for ſimple Conſonant Intervals expreſt by 12. 9. 8. and 6. whence 'twas ſaid, *Mercurius his Lyre was ſtrung with four Chords*. After this the Doctor ſhews an eaſie Method of finding Intermediate Rations, and expreſſing them in whole Numbers, and has in *p.* 122. given a Table of them, but obſerves that all the Intervals are not Harmonical.

In the Sixth Chapter he treats of Diſcords and Degrees, meaning thereby only ſuch Diſcords as fall within the Degrees of the Scale of Muſick (for there are infinite other, all proportions of Tones not Harmonick, being Diſcordant.) Now there are three varieties of theſe Degrees in the Scales of Muſick, which are as it were three Ladders differently Runged, that is, the Rungs or ſteps placed at ſeveral diſtances. Theſe Scales or Ladders thence have attained three differing Names, *viz.* Enharmonick, Chromatick, and Diatonick; of which the laſt is the moſt Natural and beſt way, and is that which is only now uſed. The other two were uſed by the Ancients, and therein lay their Varieties of Muſick, though the Author thinks them inſufficient to perform what is now done in Symphony by the Moderns with the Diatonick Scale, for they only owned 8ths, 5ths, and 4ths for Concords; and are ſuppoſed not to have uſed any Concord Muſick, but only ſingle Notes, which might make ſtronger impreſſions on the Fancy. The Ancients aſcended either by two Tetrachords conjunct, which made a 7th. and a *Proſlambanomenos*, which made the 8th. Or by two Tetrachords disjunct, the ſecond Tetrachord taking its beginning at the Fifth. In the Diatonick the Degrees were *Tones* and *Semi-tones*, Intervals more Natural. In the Chromatick the Degrees were Hemitones and Trihemitones. But the Degrees in the Enharmonick were more unequal, being only Dieſes and Dittones. Each of theſe Graduations he more particularly explains ſufficient to make them intelligible, and to ſhew what were thoſe Ancient Modes of Muſick, called *Dorian, Lydian, Phrygian*, &c. Moods. From which proceeded ſo much Delight as they relate. However he thinks as it has not been for many Ages practiſed, ſo 'tis in a manner loſt at preſent. He therefore leaving that, proſecutes his Speculations on the Diatonick Scale only in a ſhort Digreſſion (for gratifying his Readers Curioſity) has given the Proportions, Names, and Characters, as they were delivered by the Ancients, which I paſs over, being in the Book it ſelf Epitomized.

He ſhews then that there are in every Diatonick *Diapaſon* five whole Tones, and two half Tones, and according as the order of placing the Intermediate with relation to the firſt and laſt of them is, ſo the differing cliffs are conſtituted. Of which he notes, that that order according to which we make our Rings of Bells is the moſt agreeable to all Ears; and this we moſt eaſily expreſs with our Voice, either in riſing or falling Notes, the half Tones being ſo properly and Naturally mixt. But he conceives a Ring of Bells tuned to Chromatick Intervals, would ſound very uncouth and unpleaſant to moſt Ears; and if tuned to the Enharmonick, would be intolerable, and the practice of it would be a violence upon Nature. But the Diatonick Intervals being more equal and uniform, are alſo more Natural. However theſe Intervals are not all alike, but are of three kinds, namely, Hemitone Major, Tone Minor, and Tone Major, called Degrees, Minor, Major, and Maxim. Each of which has its proper place in the Octave, and that is, ſuch as compleats the Harmonick Intervals, whence in Organs and Harpſicords, where the Notes are fixt, the proper Aſcent and Deſcent cannot be made but only beginning from ſome Keys, becauſe the Flats or Half-notes to other Keys do not keep a due or fitting Proportion for that Cliff. He has given four Examples of theſe Scales, *pag.* 155. and explained them in the following Pages. He concludes this Diſcourſe with a Table, containing all the Notes and Intervals, explaining how each of thoſe in the Diatonick Scale are compoſed of thoſe three Degrees, *viz. Minor*, *Major*, and *Maxim*.

In the Seventh Chapter he treats of Diſcords; that is, of ſuch as are found in the Scales of our Muſick in the Aſcent or Deſcent in differing Cliffs, where the Degrees which are placed right for one Cliff, muſt neceſſarily be unfit for another Cliff, whence the Concords in theſe wrong Cliffs are found to have a Comma, a Dieſis, and ſometimes a Hemitone too much or too little: For the adjuſting of which there will ariſe two other kinds of Seconds, and two other kinds of Thirds, and of Sixths, and of Sevenths. But among theſe two are moſt eminent, *i. e.* the *Tritone* or *falſe fourth*, made of two Tones *major*, and one Tone *minor*, being as 45 to 32. And the *falſe fifth*, or Semidiapente, made of a Fourth and Hemitone *major*, *i. e.* 64 to 45. Theſe Diſcords, as alſo the Seconds and Sevenths are notwithſtanding of great uſe in Muſick for Delight when judiciouſly uſed. He reckons ſeven of theſe within the *Octave*, *i. e.* three Seconds, two Sevenths, and the Tritone and Semidiapente. And as many alſo in the ſecond and third Diapaſons. All theſe Proportions he particularly explains, and ſhews how they ariſe and are produced. He next Obſerves, that all Progreſſions by Concords, except by Eighths, produce Diſcord, as two Thirds *major*, two Thirds *minor*, two Fourths, two Fifths, two Sixths *minor*, two Sixths *major*, to which may be added two Tones *minor*, and two Tones *major*. And upon this Account he ſhews the beſt way how to have an Organ or Virginal tuned to make it more comprehenſive and accommodate to divers Cliffs, though it be not ſtrictly true to any, by Tuning certain Keys, either a little higher, or a little lower than the due pitch.

In the Eighth Chapter he ſpeaks of Differences, or the ſeveral Intervals between any two Notes reduced to Proportion; as a Fifth differs from a Fourth by a Tone *major*; that is, the Proportion of 3 to 2 is greater than the Proportion of 4 to 3 by the Proportion of 9 to 8. And ſo of all other Proportions the Difference between any two of them is that which is here meant by Differences; however thoſe which he here treats of are generally leſs than a Tone, they are all eaſily found by the Doctrine of Addition and Subſtracting of Proportions, according to which he has given one Table of true Diatonick Intervals, and another of falſe Diatonick Intervals, wherein a Comma or Dieſis is oft found abounding or deficient: And this is neceſſary, and cannot be avoided in any tuned Inſtrument, as Organ or Virginal, becauſe the Intervals that are neceſſary to make one Cliff perfect, are thereby neither true nor truly placed in the other. Nor can there be found any tolerable kind of Diviſion or proportioning of the Notes that will anſwer to all Cliffs, by reaſon that the grounds of Harmony depend on Proportions, and thoſe Proportions require differing Intervals to be placed in a Determinate order between the Uniſon and the Octave, whence neither the Degrees, nor the Order, that is fitted for one Cliff can be accommodated for the other. He adds alſo ſome other Scales, in which he explains the Differences by enumerating the Tones, Hemitones, Dieſes, or Comma's that are found in each; and he adds three other Tables to explain the differences of the Differences, which are found by the ſame Method as the differences themſelves, and he could have added many more, but that he thought thoſe ſufficient. I ſhall mention only one Example of his laſt Table of Differences, in which he Collects all the differences to be Nine, *i. e. Tone major*, *Tone minor*, *Hemitone max. Hemitone maj. Hemitone mid. Hemitone Pythag. Himitone minor*, *Dieſis*, *Comma*; and the compoſition of each of theſe bigger of the ſmaller, as *Tone major*, contains, 1. *Tone minor* and *Comma.* 2. *Hemitone max.* and *Hemitone minor.* 3. *Hemitone major*, and *Hemitone med.* 4. Two *Hemitones minor*, one *Dieſis*, one *Comma.*

In the Ninth Chapter is his Concluſion, where he has ſum'd up his whole Doctrine; that is, Bodies by Motion make Sound, ſound of Bodies fitly conſtituted make Tone or Tune; Tune is acuter by ſwiftneſs, graver by ſlowneſs of vibrating Motions. The Proportions of theſe are beſt found by ſtrings: If two Vibrations be commenſurate within the Number 6, they produce Concords; if incommenſurate, they make Diſcords. Concords are limited, Diſcords infinite. Among all which he has herein treated only of ſuch as are uſeful in Muſick, and given their ſeveral Proportions, Cauſes, Relations, and Compoſitions, by defined Numbers, wherein doth lye the Eſſence of Harmony and Muſick. He therefore judged this much preferrable to the *Ariſtoxenian* way of dividing a *Tone major* into Twelve equal Parts, of which 3 made a *Dieſis*, 6 *Hemitone*, 30 *Diateſſeron*, &c. For that neither this, nor Mr. *Mercator's*, nor any other like late Attempts could produce true Intervals, though they did approach them, nor give the true Grounds and Cauſes of Harmony, which are afforded by this Rational way of true Proportions. Nor could they without monſtrous Difficulty be imitated by the Voice, but the Voice endeavouring at them will naturally fall into the true Intervals that are pretty near them; as the Voice endeavouring at the Ancient *Ditone* of two Tones major will fall into that of 5 to 4, or Tone major and Tone minor: Beſides that 'tis unreaſonable to meaſure Intervals by irrational Numbers, when they may ſo eaſily, naturally, and intelligibly be adjuſted by ſmaller Numbers, and more eaſie to be comprehended.

It was not his Deſign to meddle with the Metrick part of Muſick, concerning Compoſition, Air, and Humour (which afford infinite Curious Diſquiſitions concerning it; as to its Effects upon the Paſſions cauſed by different Scales of Tones, as flats and ſharps; or different varieties of Times, as quicker or ſlower; or differences of Inſtruments for the productions of them, and why ſome are more adapt for the purpoſes than others) Nor to treat of the Receptive Faculties of Perſons from the different Conſtitution of their Organs of Hearing; nor to ſhew why ſome have and others want Muſical Ears; nor to treat of other curious Speculations concerning Muſick, which will afford the acuteſt Philoſopher buſineſs even more than enough. But only to treat of this Ground-work of all, the true ſtating of the true Proportions of Muſical Tones, both Harmonious and Diſcordant, ſuch eſpecially as are uſually compriſed in the Scales, and applyed and made uſe of in Muſick. And above all he thinks we are bound to Bleſs God for giving Muſick for the rejoycing of Mankind; and he thinks Muſick ſo Eſſential to the Worſhip and Praiſe of God, that neither *Jewiſh*, *Chriſtian*, *Mahumetan*, nor *Pagan* Worſhip was at any time performed without ſome mixture of Muſick.

ERRATA. Numb. 207.

Teſtitudo paſſim pro *Teſtudo*. Pag. 26. lin. 21. lege *Hemiſphærio*. Pag. 27. lin. 7. l. *planum*. pag. 28. lin. 11. l. *huic*. lin. 28. l. *æquales ſint quatuor ſemiſſibus earundem, patet reſiduam ſuperficiem hemiſphæricam* A C B *ablatis quatuor*. lin. 31. l. *congruat*. pag. 29. lin. 7. l. *in recta* B A. lin. 25. l. *ni*.

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Numb. 209.

PHILOSOPHICAL TRANSACTIONS.

For the Months of March *and* April, 1694.

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I. *A LETTER from* Hans Sloane, *M. D. and S. R. S: with ſeveral Accounts of the Earthquakes in* Peru October *the 20th.* 1687. *And at* Jamaica, February 19*th.* 168$\frac{7}{8}$. *and* June *the 7th.* 1692.

SIR,

THE Papers encloſed were the Accounts of the Earthquakes that were read at the Meeting of the Society, and conſidering they give Account of different Earthquakes, or that they contain differing Obſervations of the ſame Earthquake; and that we cannot have too many of the *Phænomena*, or Matters of Fact accompanying them recorded, I think it will be beſt they be all preſerved for future uſe, and I have ſent the Papers themſelves, as moſt ſatisfactory.

N°. 1. Is the Extract of a *Spaniſh* Letter from *Lima*, giving an Account of a great Earthquake which happened in *Peru* the 20*th*. of *October*, 1687.

N°. 2. Is an Account of an Earthquake which happened in *Jamaica* on Sunday the 19*th*. of *Febr.* 168$\frac{7}{8}$. which I writ my ſelf, being preſent in it.

N°. 3.

Nº. 3. Is the Extract of a Letter from one in *Jamaica*, who was in the terrible Earthquake of *June 7th.* 1692. Giving an Account of what he ſaw and felt himſelf in the Harbour of *Port-Royal*, and what one of his Servants obſerved at *Port-Royal*.

Nº. 4. Is the Extract of a Letter from thence of the 23*d.* of *September*, 1692. Giving an Account of the Sickneſs that followed the Earthquake of *Jamaica*, and the Reaſons of it.

Nº. 5. Is part of a Letter of the 20*th.* of *September*, 1692. Giving a further Account from another Hand of the ſame dreadful Earthquake of the *7th.* of *June*, 1692.

Nº. 6. Is part of a Letter, dated the *6th.* of *March*, 1693. from another Obſerving Gentleman there preſent in the ſame Earthquake of the *7th.* of *June*, 1692. Giving an Account of what he ſaw himſelf, and heard of others about it.

Nº. 7. Is part of another from the ſame Hand; giving ſome more particulars about it.

Nº. 8. Is part of a Letter from a Gentleman in *Jamaica*, to his Friend in *London*, Dated *July* 3*d.* 1693. which notwithſtanding the Gentleman's being not preſent in the Earthquake, yet conſidering his Induſtry and Accuracy in relating what he heard from others is very curious. This was communicated by Dr. *Chriſtopher Love Morley*.

To theſe if you pleaſe to contract the Map of the Harbour of *Port-Royal* and Places adjacent herewith ſent, &c. that one may ſee where the Accidents chiefly happened, it will add much to theſe Relations. It will not be amiſs likewiſe to take Notice, That that part of *Port-Royal* which ſunk was towards the Harbour Sandy, and the Sea adjoyning deep; and that Seamen who were then in the Port, aſſure me their Part and Sufferings in the Earthquake were very conſiderable. One Captain had one of his Boys roul'd out of one of the Port-holes of his Ship in its motion, by which he was drowned; and moſt of them loſt their Anchors and Cables which were towards the Wharfs or Town, which I ſuppoſe came from the Sand and Houſes falling on them; and they after the Earthquake rode in fewer Fathoms Water than before, and one may believe that ſome of the *Phænomena* may be accounted for from that. I am

Your moſt Obedient Servant,

HANS SLOANE.

N°. I.

An Extract of a Letter of Father Alvarez de Toledo *a* Franciſcan *Friar, Dated* 29 Oct. 1687. *from* Lima, *giving ſome Particulars of an Earthquake which happened there the* 20th *of that Month.*

ON *Monday*, the 20th of *Octob.* (*N. S.*) at Four of the Clock in the Morning, came a horrible Earthquake and Noiſe, with which ſome Houſes fell, and ſome were killed under their Ruines.

At Five of the Clock in the ſame Morning was another Shake with the ſame Noiſe.

At Six of the Clock in the aforeſaid Morning, when we thought we had been all in Safety, came another Shake with great Fury and ruſhing Noiſe; the Sea with great Bellowings came beyond it's Bounds, the Bells rung of themſelves, and the Deſtruction was ſo great, that no Building ſtood: The Noiſe was ſuch, that thoſe in the Fields aſſure us, that the Cattle were in great Aſtoniſhment. *Callao*, *Canete*, *Piſco*, *Chancay*, and *Los Chorillos*, are all *ruined.* There are more than 5000 dead Bodies found, and they find more daily, ſo that we know not their number.

N°. II.

The Inhabitants of *Jamaica* expect an Earthquake every Year, &c. Some of them are of Opinion, that they follow their great Rains. One of them happened on *Sunday* the 19th of *February*, 168⅞. about Eight in the Morning, I found in a Chamber one Story high the Cabinets, and ſeveral other Moveables on the Floor to reel, as if People had raiſed the Foundations of the Houſe. I look'd out at a Window to ſee what was the matter, and found that the Pigeons and other Birds in an Aviary hard by were on their Wings in a great Aſtoniſhment,

niſhment, keeping themſelves in that Poſture, not knowing where to alight. Wherefore concluding what it was, and the Danger in being in an high Brick Houſe, I made what haſte I could to get out; but before I had paſſed through two Rooms, and got to the Stair-caſe, it was over. It came by Shocks; there were three of them, with a little Pauſe between. It laſted about a Minute of Time in all; and there was a ſmall Noiſe accompanied it. A pair of Stairs higher it threw down moſt things off the Shelves, and had much more viſible Effects than below. This was generally felt all over the Iſland at the ſame time, or near it; ſome Houſes therein being crack'd and very near ruin'd, others being uncovered of their Tiles, very few eſcaped ſome Injury, and the People in them were generally in a great Conſternation, ſeeing them dance. The Ships in the Harbour at *Port-Royal* felt it; and one who was Eaſtward of the Iſland coming thither then from *Europe*, met with, as he ſaid, at the ſame time, an Hurricane. One riding on Horſeback was not ſenſible of it. A Gentleman being at that time abroad in his Plantation, told me, he ſaw the ground riſe like the Sea in a Wave, as the Earthquake paſſed along, and that it went Northward; for that ſome ſmall time after he had felt it, he ſaw by the Motion of the tops of the Trees on Hills ſome Miles diſtant, that it had then reach'd no further than that place. The *Spaniards* who inhabited this Iſland, and thoſe neighbouring, built their Houſes very low; and they conſiſted only of Ground-rooms, their Walls being made of Poſts, which were as much buried underground as they ſtood above, on purpoſe to avoid the Danger which attended other manner of Building from Earthquakes. And I have ſeen in the Mountains afar off bare Spots, which the Inhabitants told me, were the Effects of Earthquakes throwing down part of the Hills, which continued bare and ſteep.

Nº III.

Jamaicá, June 20. 1692.

——The terrible Earthquake which happen'd the 7th inſtant between Eleven and Twelve of the Clock at Noon, ſhook down and drowned Nine Tenths of the Town of *Port-Royal* in two Minutes time, and all by the Wharf-ſide in leſs than one; very few eſcap'd there. I loſt all my People and Goods, my Wife and two Men, Mrs. *B.* and her Daughter. One white Maid eſcap'd, who gave me an Account that her Miſtreſs was in her Cloſet two Pair of Stairs high, and ſhe was ſent into the Garret, where was Mrs. *B.* and her Daughter when ſhe felt the Earthquake, and bid her take up her Child and run down; but turning about, met the Water at the top of the Garret Stairs; for the Houſe ſunk down right, and is now near 30 Foot under Water. My Son and I went that Morning to *Liguania*, the Earthquake took us in the Mid-way between that and *Port-Royal*, where we were near being overwhelmed by a ſwift rowling Sea, ſix Foot above the Surface, without any Wind; but it pleaſed God to ſave us, being forced back to *Liguania*, where I found all Houſes even with the Ground; not a place to put ones Head in, but in Negro Houſes. The Earth continues to ſhake five or ſix times in 24 Hours, and often trembling. Great part of the Mountains fell down, and fall daily. I pray God divert thoſe heavy Judgments which ſtill threaten us.

Nº IV.

We have had a very great Mortality ſince the great Earthquake (for we have little ones daily) almoſt half the People that eſcap'd upon *Port-Royal* are ſince dead of a Malignant Fever, from Change of Air, want of dry Houſes, warm Lodging, proper Medicines, and other Conveniencies.

Nº. V.

Jamaica, Sept. 20. 1692.

I doubt not but you have heard before this of our great Calamity: but however I will give you the Particulars as near as I can. In the firſt place, great part of *Port-Royal* is ſunk; that where the Wharfs was, is now ſome Fathoms of Water: All the Street where the Church ſtood is overflow'd, that the Water ſtands ſo high as the upper Rooms of thoſe which are ſtanding. The Earth when it opened and ſwallowed up People, they roſe in other Streets, ſome in the middle of the Harbour, and yet ſaved; though at the ſame time I believe there was loſt about 2000 Whites and Blacks. At the North about 1000 Acres of Land ſunk, and Thirteen People with it; all our Houſes thrown down all over the Iſland, that we were forced to live in Hutts. The two great Mountains at the entring into *Sixteen Mile Walk* fell and met, and ſtopt the River, that it was dry from that place to the *Ferry* for a whole Day; and vaſt quantities of Fiſh taken up, which was greatly to the Relief of the Diſtreſſed. At *Yellows* a great Mountain ſplit, and fell into the Level Land, and covered ſeveral Settlements, and deſtroy'd nineteen white People. One of the Perſons, whoſe Name was *Hopkins*, had his Plantation remov'd half a Mile from the place it formerly ſtood; and now good Proviſions growing upon it. Of all Wells from a Fathom to Six or Seven, the Water flew out at the top with the great Motion of the Earth. Since it has continued ſhaking ſometimes two or three times in a day; ſo at Night ſometimes more, ſometimes leſs; but God be praiſed, they are but ſmall. Our People ſettled a Town at *Leguanea* ſide, and there is about 500 Graves already, and People every day a dying ſtill. I went about once to ſee it, and I had like to have tipt off. Poor Capt. *Watſon* was drown'd. All this I do aſſure

ſure you is Truth; and if I had Time, could give an Account of a great many more of the like.

Nº. VI.

What you deſire concerning our Earthquake in *Jamaica*, I will anſwer as near as I can to what I ſaw and heard; *Port-Royal* being the place where I lived, I ſhall begin with what I met with there. On *Tueſday* the 7th of *June*, 1692. betwixt Eleven and Twelve at Noon, I being at a Tavern, we felt the Houſe ſhake, and ſaw the Bricks begin to riſe in the Floor, and at the ſame inſtant heard one in the Street cry, *An Earthquake*. Immediately we run out of the Houſe, where we ſaw all People with lifted up Hands begging God's Aſſiſtance. We continued running up the Street, whilſt on either ſide us, we ſaw the Houſes, ſome ſwallowed up, others thrown on Heaps; the Sand in the Street riſe like the Waves of the Sea; lifting up all Perſons that ſtood upon it, and immediately dropping down into Pits; and at the ſame Inſtant a Flood of Water breaking in, and rowling thoſe poor Souls over and over; ſome catching hold of Beams and Rafters of Houſes,others were found in the Sand that appeared when the Water was drain'd away, with their Legs and Arms out; we beholding this diſmal Sight. The ſmall piece of Ground whereon Sixteen or Eighteen of us ſtood (praiſed be God) did not ſink. As ſoon as the violent Shake was over, every Man was deſirous to know if any part of his Family were left alive. I endeavoured to go towards my Houſe upon the Ruines of the Houſes that were floating upon the Water, but could not: At length I got a Canoa, and row'd up the great Sea ſide towards my Houſe, where I ſaw ſeveral Men and Women floating upon the Wreck out to Sea; and as many of them as I could I took into the Boat, and ſtill row'd on till I came where I thought my Houſe had ſtood, but could not hear of neither my Wife nor Family; ſo returned again to that little part remaining above Water.

But ſeeing all People endeavouring to get to the Iſland, I went amongſt them, in hopes I might hear of my Wife, or ſome part of my Family, but could not. Next Morning I went from one Ship to another, till at length it pleaſed God that I met with my Wife and two of my Negroes. I then asked her, how ſhe eſcaped. She told me, when ſhe felt the Houſe ſhake, ſhe run out, and call'd all within to do the ſame: She was no ſooner out, but the Sand lifted up; and her Negro Woman graſping about her, they both dropt into the Earth together; and at the ſame inſtant the Water coming in, rowl'd them over and over, till at length they catch'd hold of a Beam, where they hung, till a Boat came from a Spaniſh Veſſel and took them up.

The Houſes from the *Jews Street end* to the *Breaſtwork* were all ſhak'd down, ſave only Eight or Ten that remained from the Balcony upwards above Water: And as ſoon as the violent Earthquake was over, the Watermen and Sailers did not ſtick to plunder thoſe Houſes; and in the time of their Plunder one or two of them fell upon their Heads by a ſecond Earthquake, where they were loſt.

As ſoon as the violent Shake was over, the Miniſter deſired all People to join with him in Prayer; and amongſt them were ſeveral *Jews* that Kneeled, and Anſwered as they did. Nay, I heard one ſay, they were heard to call upon Jeſus Chriſt: A thing worth Obſervation.

Several Ships and Sloops were over-ſet and loſt in the Harbour: Amongſt the reſt the *Swan-Frigat* that lay by the Wharf to Careen, by the violent Motion of the Sea, and ſinking of the Wharf, was forced over the tops of many Houſes; and paſſing by that Houſe where my Lord *Puke* lived, part of it fell upon her, and beat in her Round Houſe: She did not over-ſet, but helpt ſome Hundreds, in ſaving their Lives.

As to the Fire-balls which you heard was ſeen in the Air, it was a great Falſhood : For I neither ſaw nor heard (during our Months ſtay after the Earthquake) any ſuch thing ; but a great and hideous rumbling was heard in the Mountains ; inſomuch that it frighted many Negroes that had been run away ſome Months from their Maſters, and made them come home, and promiſe not to run away any more.

The Water that iſſued from the *Saltpanns Hills* I ſaw my ſelf, as alſo Mr. *Aſhborne* and one *Pinnock* a Quaker of *Leguanee* ; it forced it's paſſage out from the Hill in (I believe) twenty or thirty ſeveral places, ſome more forcibly than others ; for in eight or ten places it came with that Violence, that had ſo many Sluces been drawn up at once, they could not have run with greater force ; and moſt of them ſix or ſeven Yards high from the Foot of the Hill ; three or four of the leaſt of them we obſerved were near ten or twelve yards high in the Mountain. We ſtood ſome time in looking on this miraculous ſight : At length we taſted the Water in moſt of the places ; all which we taſted, we found to be brackiſh, of which we could not imagine the Reaſon, nor from whence the Water ſhould ariſe : It continued running that Afternoon, all Night, till next Morning about Sun-riſe, at which time the *Salt-panns* were quite overflow'd. Therefore you may judge it's Force in running ; for both *Salt-panns* and *Mountain* you know very well.

The Mountains betwixt *Spaniſh Town* and *Sixteen-Mile-Walk*, as the Way lies along the River, if you remember, about the mid-way they are almoſt perpendicular, eſpecially on the other ſide the River ; thoſe two Mountains in the violent Shake of the Earthquake joined together, which ſtopt the Paſſage of the River, and forced it to ſeek another, which was a great way in and out amongſt the Woods and Savana's ; for it was Nine Days before the Town had any Relief from it : Inſomuch

much that before it came the People were in thoughts of removing into the Country, concluding it had been ſunk as *Port-Royal* was. The Mountains along the River are ſo thrown on Heaps, that all People are forced to go by *Guanaboa* to *Sixteen-Mile-Walk.*

The time we continued on the Iſland after the Earthquake was at Mr. *Bosby*'s, who had as miraculous an Eſcape, and his Wife, as my Wife had. He likewiſe told us, That that Afternoon, coming to his Plantation, he found the Ground opened in ſeveral places; and in one two Cows were dropt in and ſmothered.

The Weather was much hotter after the Earthquake than before; and ſuch an innumerable quantity of *Muſketoes*, that the like was never ſeen ſince the Inhabiting of the Iſland.

The Mountains at *Galloes* far'd no better than thoſe of *Sixteen-Mile-Walk*; a great part of one of them falling down, drove all the Trees before it; and at the Foot of the Mountain there was a Plantation that was wholly overthrown and buried in it.

I cannot remember any thing more at preſent, that may be material.

N°. VII.

Deene, *March.* 22. $169\frac{2}{3}$.

As to the Mountains in *Leguanee*, they fell in ſeveral places, and in ſome very ſteep; but the ſteepeſt Mountain that we heard fall, was that at *Gallowes*, which I heard did much Damage by it's rowling down.

The Water in the Streets of *Port-Royal* did not ſpout up, as you have heard; but in the violent Shake the Sand cracking and opening in ſeveral places where People ſtood, they ſinking into it; the Water boiled out of the Sand, that cover'd many, and ſaved others.

As to what I writ concerning the River and Town, I did not ſee my ſelf; but heard by ſeveral hands, that it was eight or nine days before the River came down ſo far as the Town.

No. VIII.

Port-Royal in *Jamaica*, *July* 3. 1693.

THe Year 1692. began in *Jamaica* with very dry and hot Weather, which continued till *May*, when there was very blowing Weather, and much Rain to the end of the Month, from which time, till the time the Earthquake happened, 'twas exceſſive hot, calm and dry; and on *Tueſday* the 7th of *June*, about 40 Minutes paſt Eleven in the Forenoon, it being then a very hot, clear, Sun-ſhine Day, ſcarce a Cloud to be ſeen in the Sky, or a Breath of Air to be felt, hapned that great Shake, ſo fatal to this place, and to the whole Iſland, which for its Violence and ſtrange Effects, may perhaps be compared with the greateſt, that ever yet happened in the World, and may as well deſerve the Memory of future Ages.

It began with a ſmall trembling, ſo as to make People think there was an Earthquake, which Thoughts were immediately confirm'd by a ſecond Shake ſomething ſtronger, accompanied all the while with a hollow rumbling Noiſe, almoſt like that of Thunder, which made them begin to run out of their Houſes. But alas! this was but ſhort Warning for them to provide for their Safety; for at the Heels of this Second, came the Third violent Shake, which in leſs than a Minute's time (it continuing near a Minute) ſhook the very Foundation of *Port-Royal* in ſuch ſort, that at leaſt two parts in three, I believe I may ſafely ſay three parts in four, of the Houſes, and the Ground whereon they ſtood, and moſt part of thoſe who inhabited them, all ſunk at once quite under Water; and on the place which was left, and is now ſtanding, ſhook down and ſhatter'd the Houſes in ſo violent a manner, that at our landing, it look'd more like a Heap of Rubbiſh, than any thing elſe, there being (I believe) ſcarce one Houſe in ten left ſtanding, and thoſe ſo crackt and ſhatter'd, that but few of them were fit, or thought ſafe to live in, and ſtand now empty. All thoſe Streets which were next the Water, towards the Harbour-ſide, where there were excellent Wharfs, cloſe to which Ships of 700 Tunn might lie and deliver their Loading, where were the beſt Store-houſes and Conveniences for Merchants, where were brave ſtately Buildings, where the Chief Men of the Place liv'd, and which were in all reſpects the principal parts of *Port-Royal*, now lie in Four, Six, or Eight Fathom Water. That part which is now ſtanding, is part of the end of that Neck of Land which runs into the Sea, and makes this Harbour (at the Extremity of which ſtands the Fort, not ſhook down, but much ſhatter'd by the Earthquake, and is now a perfect Iſland; the whole Neck of Land from the Port of *Port-Royal* now ſtanding, to the Palliſadoes, or other end of *Port-Royal* towards the Land, (which is above a quarter of a Mile) being quite diſcontinued and loſt in the Earthquake; and is now alſo, with all the Houſes that ſtood very thick thereon, quite under Water; all which part or Neck of Land is diſcontinued, (as alſo all the other parts of this place which ſunk) were, for what I can learn, nothing but perfect Sand, and by People driving down Timber and Wharfing, &c. were by little and little gained in time out of the Sea, which now has at once recovered all again; whereby we may ſee how dangerous it is to contend with a powerful Enemy.

I have talkt with a few Men that came hither with *Venables*, when he Conquered this Place for *Cromwel*, and particularly with one Capt. *Hals*, (for whom I happened to have a Letter from *London*) who all ſay, that when they came here, the place whereon *Port-Royal* was ſince built, was like one of the Keys or little Iſlands that lie off this Harbour, (which by the way are all ſtanding) but continued by a ſmall Ridge of Sand, which then juſt appeared above Water, with the Land, (I mean the other part of the Neck of Land) and believe there is now as much Ground left ſtanding as then. But this all People know, that the part of Land whereon *Port-Royal* was built, was always encreaſing ſince firſt inhabited. But Capt. *Hals* goes further, telling me, that one, whom he knew very well, that came here with them under *Venables*, and who had been here ſome Years before under one *Jackſon*, who took and plunder'd St. *Jago*, *&c.* he very well remembers, at his coming hither, told him, That the Point or Place now ſtanding, when he was here before under the ſaid *Jackſon*, was wholly ſeparated from Land by the Sea, (as it is at this time) and pointing to the Ridge of Sand above-mentioned, ſaid, That did not appear when I was here before. And it is commonly ſaid by People here, that Ships have formerly ſailed over that part of the Neck of Land, now ſunk under Water; tho' what Grounds they have for that Saying (which is common) I could never learn. Indeed 'tis very probable; for already, ſince the Earthquake, the Sandy Ground at the Palliſadoes, or other ſide, hath gained from the Sea ſeveral Acres. On this ſandy Neck of Land did People build great heavy Brick Houſes, whoſe Weight, on ſo ſandy a Foundation, may be ſuppoſed to contribute much to their Downfall; for the Ground gave way as far as the Houſes ſtood only, and no further; part of the Fort and Palliſadoes at the other end of the Houſes ſtanding.

This part of *Port-Royal* which is now ſtanding, is ſaid to ſtand upon a Rock: But alas! the ſtrange Rents and Tearings of the Mountains here, ſufficiently evince, that Rocks and Sand are equally able to withſtand the Force

of

of a violent Earthquake. If this place be nothing but Sand (as ſome would have it, that are it's no Well-wiſhers) it ſeems ſtrange that the Force of the Earthquake did not diſſipate and diſſolve the very Foundation of it, and that it did not fall to pieces and ſcatter under Water, as the reſt of the place did; for the Shake was ſo violent, that it threw People down on their Knees, and ſometimes on their Faces, as they run along the Streets to provide for their Safety; and it was a very difficult matter to keep ones Legs. The Ground heaved and ſwelled like a rolling ſwelling Sea; ('tis a ſtrange Compariſon; but every body here uſing it, I venture to do ſo likewiſe) by which means ſeveral Houſes now ſtanding were ſhuffled and moved ſome Yards from their places. One whole Street (a great many Houſes whereof are now alſo ſtanding) is ſaid to be twice as broad now as before the Earthquake; and in many places the Ground would crackle and open, and ſhut quick and faſt: Of which ſmall Openings I have heard Major *Kelly* and others ſay, they have ſeen two or three hundred at one time, in ſome whereof many People were ſwallowed up; ſome the Earth caught by the middle, and ſqueezed to Death; the Heads of others only appeared above Ground; ſome were ſwallowed quite down, and caſt up again by great Quantities of Water; others went down, and were never more ſeen. Theſe were the ſmalleſt Openings: Others that were more large, ſwallowed up great Houſes; and out of ſome Gapings would iſſue whole Rivers of Water, ſpouted up a great height into the Air, which ſeemed to threaten a Deluge to that part of *Port-Royal*, which the Earthquake ſeemed to favour, accompanied with ill Stenches and offenſive Smells, by means of which Openings, and the Vapours at that time belcht forth from the Earth into the Air; the Sky, which before was clear and blue, was in a Minute's time become dull and reddiſh, looking (as I have heard it compared often) like a red hot Oven: All theſe dreadful Circumſtances occurring at once, accompanied all the while with prodigious loud Noiſes from the Mountains, occaſioned by their falling, &c. And alſo a hollow Noiſe under Ground, and People running from one place to another diſtracted with Fear, looking like ſo many Ghoſts, and more reſembling the Dead than the Living, made the whole ſo terrible, that People thought the Deſolution of the whole Frame of the World was at hand. Indeed 'tis enough to raiſe melancholy Thoughts in a Man now, to ſee the Chimneys and Tops of ſome Houſes, and the Maſts of Ships and Sloops, which partak'd of the ſame Fate, appear above Water; and when one firſt comes aſhore, to ſee ſo many Heaps of Ruines, many whereof by their largeneſs ſhew, that once there had ſtood a brave Houſe; to ſee ſo many Houſes ſhatter'd, ſome half fallen down, the reſt deſolate and without Inhabitants; to ſee where Houſes have been ſwallowed up, ſome appearing half above ground, and of others the Chimneys only; but above all, to ſtand on the Sea-ſhore, and to look over that part of the Neck of Land, which for above a Quarter of a Mile was quite ſwallow'd up; there, where once brave Streets of ſtately Houſes ſtood, appearing now nothing but Water, except here and there a Chimney, and ſome parts and pieces of Houſes, ſerving only to mind us of their ſad Misfortune, now Habitations for Fiſh, contrary to the Intent of the firſt Builders.

And tho' *Port-Royal* was ſo great a Sufferer by the Earthquake, yet it left more Houſes ſtanding there, than in all the Iſland beſides, all over which 'tis ſaid to rage more furiouſly, than at *Port-Royal*; and this ſeems to be true; for it was ſo violent in other places, that People could not keep their Legs, but were violently thrown down on the Ground, where they lay on their Faces with their Arms and Legs ſpread out, to prevent being tumbled and thrown about by the almoſt incredible Motion of the Earth, like that as is the general Compariſon of a Great Sea.

It ſcarce left a Planters Houſe or Sugar-work ſtanding all over the Iſland: I think it left not a Houſe ſtanding at *Paſſage-Fort*, and but one in all *Liganee*, and none in *St. Jago*, except a few low Houſes built by the wary *Spaniards*. And 'tis not to be doubted, but that had there been 500, or 5000 Towns in *Jamaica*, the Earthquake would have ruined every one. In ſeveral places in the Country the Earth gaped prodigiouſly: On the North-ſide, the Planters Houſes, with greateſt part of their Plantations, (and the Planters Houſes lie not very near to one another) were ſwallowed, Houſes, People, Trees, all up in one Gape; inſtead of which, appeared for ſome time after a great Pool or Lake of Water, covering above a Thouſand Acres, which is ſince dryed up, and now is nothing but a looſe Sand, or Gravel, without any the leaſt Mark or Sign left, whereby one may judge, that there ever had ſtood a Tree, Houſe, or any thing elſe. In *Clarendon* Precinct the Earth gaped and ſpouted up with a prodigious Force great Quantities of Water into the Air, above Twelve Miles from the Sea; and all over the Iſland, there were abundance of Gapings, or Openings of the Earth, many thouſands; Marks of many whereof, which upon their cloſing they left behind them, any one cannot chuſe but ſee, that goes into the Country; and I have ſeen ſeveral. But in the Mountains are ſaid to be the moſt violent Shakes of all; and 'tis a generally receiv'd Opinion, that the nearer to the Mountains, the greater the Shake; and that the Cauſe thereof, whatever it is, lies there. Indeed, they are ſtrangely torn and rent; inſomuch that they ſeem to be of quite different Shapes now from what they were, eſpecially the blew, and other higheſt Mountains, who ſeem to be the greateſt Sufferers; as if, for preſuming to make Reſiſtance againſt ſo ſtrong an Enemy, they had fared the worſe for it; which during the time of the firſt great Shake, and as long as the great Shakes continued, which was above two Months after the firſt Shake (during which time the Shakes came very ſtrong and thick, ſometimes two or three in an Hour) bellowed forth prodigious, loud, terrible Noiſes and Ecchoings, as if they were ſenſible of thoſe dreadful Convulſions, which ſo raged within their Bowels, and in ſo violent a manner tore and rent them aſunder, as if they complained of the Cruelties of that great (I believe I may ſay greateſt) Enemy to Nature; threatning to caſt this Iſland into it's firſt Chaos, or at leaſt into a new Model or Shape, different from that which Nature firſt gave it; breaking one Mountain, and thereof making two or three; and joining two Mountains, and making thereof one, cloſing up the unhappy Valley betwixt. And at *Tallowes* particularly, ſome Families, who lived betwixt two Mountains, were ſhut up and buried under them.

Not far from which place part of a Mountain, after having made ſeveral Leaps or Moves, overwhelmed a whole Family, and great part of a Plantation, lying a Mile off. And a large high Mountain, near *Port-morant,* near a days Journey over, is ſaid to be quite ſwallowed up; and in the place where it ſtood there is now a great Lake of Four or Five Leagues over. But thoſe things happened in Lower Mountains: But in the blew Mountains, and its nigh Neighbours, from whence came thoſe dreadful Roarings, terrible and amazing to all that heard them, may be reaſonably ſuppoſed to be many ſtrange Alterations of the like Nature: But thoſe wild Deſert places, being very rarely or never viſited by any body, not by Negro's themſelves, we are yet ignorant of what happened there; but the Aſtoniſhing Noiſes that came from thence, and their miſerable ſhatter'd Appearance, appearing half naked, and deprived of their ſtately Ornaments, large aſpiring Trees, and whereas they uſed to afford a fine green Proſpect, now one half part of them at leaſt ſeeming to be wholly deprived of their natural Verdure and ornamental Coverings in ſuch ſort, that they have not a Leaf to cover their Nakedneſs, appearing bare and ragged, in ſuch poor torn Shapes, that ſurely it will put any thoughtful Man into a contemplative Poſture, who ſhall look at them. There one may ſee, where the Tops of great Mountains have fallen, ſweeping down all the Trees, and every thing in its way, and making a Path quite from top to bottom; and other places, which ſeem to be peeled, and bare a Mile together; which vaſt pieces of Mountains, with all the Trees thereon, falling together in a huddle and confuſed manner, ſtopped up moſt of the Rivers for about 24 hours; which afterwards, having found out new Paſſages, brought down into the Sea, and this Harbour, ſeveral hundred thouſand Tunn of Timber, (as I have heard computed from the moſt knowing People there) which would ſometimes float in the Sea in ſuch prodigious Quantities, that they look'd like moving Iſlands. I have ſeen ſeveral of thoſe large Trees on this Shoar, all deprived of their Bark and Branches, and generally very much torn by the rocky Paſſages, through which, by the force of a falling Stream, and their own weight, they might be ſuppoſed to be driven. One great Trunk of a Tree particularly I have ſeen amongſt the reſt, ſo ſqueezed as a Sugar-cane after it has paſs'd the Mill. Some are of Opinion that the Mountains are ſunk a little, and are not ſo high as they were: Others think the whole Iſland is ſunk ſomething by the Earthquake. *Port-Royal* is ſaid to be ſunk a Foot; and in many places in *Liganee* I have been told, are Wells, which require not ſo long a Rope to draw Water out of them now, as before the Earthquake, by two or three Foot; which ſeems a

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a ſort of a demonſtration, that either the Land is ſunk, or the Sea riſen, the former of which ſeems moſt probable. Nor are theſe all the Effects of the Earthquake, no, the Water had in ſome meaſure its ſhare as well as the Land. In this Harbour in *Port-Royal* at the time of the great ſhake (though Seas very calm) was ſuddenly raiſed ſuch a ſtrange Emotion in the Water, that immediately it ſwelled as in a Storm, great large Waves appearing on a ſudden rolling with ſuch force that they drave moſt Ships (if not all) in the Harbour from their Anchors; breaking their Cables, to the great hazard of all of them, and to the loſs of ſome ſmall Ships and Sloops, *&c.* I heard particularly a Maſter of a large Ship of about 300 Tun ſay, that he then rode with two ſtrong Cables, both which this ſtrange Violence of the Water brake in an inſtant, and that he thought he ſhould have loſt his Ship, which mounted as in a great Storm, *&c.* and ſo it fared with the reſt of the Ships; but this was ſoon over, and in a little time all ſmooth again. One Capt. *Phips* told me, That he and another Gentleman happened at the time of the Earthquake, to be in *Liganee* by the Sea-ſide; and that at the time of the great Shake the Sea retired from the Land in ſuch ſort, that for two or three Hundred Yards the bottom of the Sea appeared dry, whereon they ſaw lye ſeveral Fiſh, ſome whereof the Gentleman who was with him ran and took up, and in a Minute or two's time the Sea returned again and overflowed great part of the Shoar. At *Tallhouſe* the Sea is ſaid to retire above a Mile.

'Tis thought there were loſt in all Parts of the Iſland 2000 People, and had the Shake happened in the Night, very few would have eſcaped alive; and thoſe that had, would in all probability have been knock'd in the Head by the *Negroes*, and the Iſland to all intents and purpoſes quite ruined.

Since my Arrival here I have felt ſeveral ſhakes; the firſt and greateſt whereof was on *Good-Friday*, it lifted me compleatly off my Chair, and ſet me on my Legs, and was ſaid to be a ſmall Shake; but did not then hear the Noiſe (minding ſomething elſe) which always immediately foreruns, or rather accompanies it, but have ſince felt ſeveral leſs Shakes, and heard the Noiſe often, which is very loud, and may be eaſily taken, by thoſe not uſed to hear it, for a ruſtling Wind, or for a hollow rumbling Thunder; but hath ſome puffing Blaſts peculiar to it ſelf, and are moſt like thoſe of a Match made of Brimſtone, when lighted, but in a much greater degree, and ſuch as a large Magazine of Brimſtone may be ſuppoſed to make when on fire; it is alſo accompanied with a Noiſe, which may be pretty well imitated, by putting the Tongue to the Roof of the Mouth, and in a whiſpering hollow Tone loudly pronouncing *hur' r r r r r*, whereby it is eaſily diſtinguiſhed from either Wind or Thunder; and People are generally running out of their Houſes before the Shake comes, and then the Noiſe ſeems to come from below, and to be juſt under ones Feet, which makes the Trembling of the Earth more terrible than otherwiſe it would be. It is obſervable that every ſmall Shake is felt on Ship-board as ſenſibly as on Shoar, the Water ſhaking as well as the Land.

It is likewiſe obſerved, that in Windy Weather there never comes a ſhake, but in very Calm Weather is always expected, and uſually comes accordingly (though of late has diſappointed us often, ſo that now we never expect them.) And this Obſervation hath held true in every ſhake that hath happened ſince my being here, and (as is ſaid by the moſt Curious, and indeed all People here) in every ſhake that hath happened ſince the firſt great one.

'Tis obſerved, that after Rain they are generally ſmarter than at other times, which may be from the ſhutting up of the Pores of the Earth, whereby the force is more pent in, and hath not ſo free a Paſſage to perſpire and ſpend it ſelf, &c.

Shakes often happen in the Country, not felt at *Port-Royal*; and ſometimes are felt by thoſe that live in and at the foot of the Mountains, and by no body elſe.

'Tis obſerved, that ſince the Earthquake, the Land-breezes often fail us, and inſtead thereof, the Sea-breezes often blow all Night, a thing rarely known before, but ſince common.

In *Port-Royal*, and in many Places all over the Iſland, much Sulphureous,Combuſtible Matter hath been found, ſuppoſed to have been thrown out, upon the opening of the Earth, which upon the firſt touch of Fire would flame and burn like a Candle.

What may be the Cauſe of this Earthquake, or how deep the Cauſe may be in the Earth, &c. from ſome foregoing Circumſtances, a wiſe Man may give a near gueſs at: But why the Earth ſhould ſhake for a quarter of a Minute, and then ſtand ſtill for ſix, or ſeven, or ten Days, then ſhake again, and ſo continue to ſhake now and then by fits; or why ſhakes ſhould happen in calm ſtill Weather, and rarely or never in Windy or Rainy Weather, which from a ſtrict Obſervation is a certain truth, ſeem to be difficult Queſtions.

St. *Chriſtophers*, one of the *Caribee* Iſlands, was heretofore much troubled with Earthquakes, which upon an Eruption of a great Mountain there of Combuſtible Matter, which ſtill continues, wholly ceas'd, and have never been felt there ſince; wherefore many expect ſome ſuch Eruption in ſome of the Mountains there, though we hope there is no neceſſity for it; the ſhakes having been obſerved to loſe their force, and to become weaker and weaker ever ſince the firſt Fatal one; and 'tis now ſo long ſince we have heard any, except now and then one ſo weak as ſcarce to be felt, that we have great hopes they will ſoon quite ceaſe.

After the great ſhake, thoſe People that eſcaped (as many as could) got on board the Ships in the Harbour, where many continued about two Months after; the ſhakes all that time being ſo violent,and coming ſo thick, ſometimes two or three in an hour's time, accompanied with frightful Noiſes, both from under the Earth, and from the continual falling and breaking of the Mountains, that they dared not come a-ſhoare. Others went to the place called *KingStown* (or by others *Killcown*) where, from the firſt clearing of the Ground, and from bad Accommodations, then Hutts built with Boughs,and not ſufficient to keep out Rain, which in great and an unuſual manner followed the Earthquake, lying wet, and wanting Medicines, and all Conveniencies, *&c.* they dyed miſerably in heaps. Indeed there was a general Sickneſs (ſuppoſed to proceed from the hurtful Vapours belch'd from the many openings of the Earth) all over the Iſland, ſo general, that few eſcaped being ſick; and 'tis thought it ſwept away in all Parts of the Iſland 3000 Souls; the greateſt part from *KingStown* only, yet an unhealthy Place. Beſides, the great quantities of dead People floating from one ſide of the Harbour to the other, as the Sea and Land-breezes blew them, ſometimes 100 or 200 in a heap, may be thought to add ſomething to the Unhealthfulneſs of this Place.

I have now given you the beſt Account I can of the Earthquake, which I was forced to pick up from ſeveral People, wherein, nevertheleſs, I have been as cautious, that I believe I have not wrote any thing but what is real and true.

II. *Concerning the Diſtance of the fixed Stars.*

By the Honourable Francis Roberts, *Eſq*; *S.R.S.*

THE Ancient Aſtronomers, who had no other way of Computing the Diſtances of the Heavenly Bodies but by their Parallax to the Semidiameter of the Earth, and being never able to diſcover any in the fixt Stars, did from thence rightly enough infer, that their Diſtance was very great, and much exceeding that of the Planets, but could go no farther otherwiſe than by uncertain gueſs.

Since the *Pythagorean* Syſtem of the World has been revived by *Copernicus*, (and now by all Mathematicians accepted for the true one) there ſeemed ground to imagine that the Diameter of the Earth's Annual Courſe (which according to our beſt Aſtronomers is at leaſt 40000 times bigger than the Semidiameter of the Earth) might give a ſenſible Parallax to the fixt Stars, though the other could not, and thereby determine their Diſtance more preciſely.

But though we have a Foundation to build on ſo vaſtly exceeding that of the Ancients, there are ſome Conſiderations may make us ſuſpect that even this is not large enough for our purpoſe.

Monſieur *Hugens* (who is very exact in his Aſtronomical Obſervations) tells us, he could never diſcover any viſible Magnitude in the fixt Stars, though he uſed Glaſſes which Magnifie the apparent Diameter above 100 times.

Now, ſince in all likelihood the fixt Stars are Suns, (perhaps of a different Magnitude) we may as a reaſonable *Medium* preſume they are generally about the bigneſs of our Sun.

Let us then (for Example) ſuppoſe the *Dog-Star* to be ſo. The Diſtance from us to the Sun being about 100 times the Sun's Diameter (as is demonſtrable from the Sun's Diameter being 32 Minutes) it is evident that the Angle under which the *Dog-Star* is ſeen in Mr. *Hugens*'s Teleſcope, muſt be near the ſame with the Angle of its Parallax to the Sun's Diſtance, or Semidiameter of the Earth's Annual Courſe; ſo that the Parallax to the whole Diameter, can be but double ſuch a quantity, as even to Mr. *Hugens*'s nice Obſervation is altogether inſenſible.

The Diſtance therefore of the fixt Stars ſeems hardly within the reach of any of our Methods to determine; but from what has been laid down, we may draw ſome Concluſions that will much illuſtrate the Prodigious vaſtneſs of it.

1. That the Diameter of the Earth's Annual Orb (which contains at leaſt 160 Millions of Miles) is but as a Point in compariſon of it; at leaſt it muſt be above 6000 times the Diſtance of the Sun: For if a Star ſhould appear through the aforeſaid Teleſcope half a Minute broad (which is a pretty ſenſible Magnitude) the true apparent Diameter would not exceed 18 3d. Minutes, which is leſs than the 6000th. part of the apparent Diameter of the Sun, and conſequently the Sun's Diſtance not the 6000th. part of the Diſtance of the Star.

2. That could we advance towards the Stars 99 Parts of the whole Diſtance, and have only $\frac{1}{100}$ Part remaining, the Stars would appear little bigger to us than they do here: For they would ſhew no otherwiſe than they do through a Teleſcope, which Magnifies an Hundred fold.

3. That at leaſt Nine Parts in Ten, of the Space between us and the fixed Stars can receive no greater Light from the Sun, or any of the Stars, than what we have from the Stars in a clear Night.

4. That Light takes up more time in Travelling from the Stars to us, than we in making a *Weſt-India* Voyage (which is ordinarily performed in ſix Weeks.) That a Sound would not arrive to us from thence in 50000 Years, nor a Cannon-Bullet in a much longer time. This is eaſily computed, by allowing (according to Mr. *Newton*) Ten Minutes for the Journey of Light from the Sun hither, and that a Sound moves about 1300 Foot in a Second.

III. *An Account of a Stone of a Prodigious ſize extracted by Section out of a Woman's Bladder, now living, on the Eighth day of* November, 1693. *by Mr.* Baſil Wood, *Surgeon.*

THE Perſon who performed this, being prevailed upon by ſome Friends to give the Curious an Account of the extraordinary bigneſs and ſhape of this Stone, has communicated it to the Publiſher of theſe Tranſactions, in the following words.

This Stone was taken from Mrs. *Henchman*, a Widow Gentlewoman, of the Age of about One and Fifty Years, who Lodges in *Kings-Head-Court* in *Holborn.* Its ſhape is not very unlike to a ſort of Spring-Purſe (as they are called) which many People uſe; and its ſurface is indifferently ſmooth, excepting only that there are Four Protuberances, each of which is about the ſize of a Hazel-Nut; theſe ſeem to have been at firſt leſſer Stones, which falling into the Bladder after that the great Stone was almoſt grown to its full bigneſs there, were joyned to it, firſt by adheſion, and at laſt became all one Body with it. It is alſo very probable that the leſſer end of the great Stone, was once a diſtinct Stone, and fell into, or was ſeparately formed in the Bladder, a good while after that the bigger part had taken poſſeſſion there.

The length of the Stone is 3 ¼ Inches. Its breadth, where largeſt, is very near 3 ¼ Inches. Its thickneſs is 1 ⅞ Inch. Its weight is Nine Ounces and a half *Averdupois.*

Dr. *Molineux* (that learned Phyſician of *Dublin*) in his Account of an extraordinary large Stone ſpontaneouſly voided by a Woman through the *Urethra*, inſerted in N°. 202 of the Tranſactions, has mentioned two or three Notions, which I ſuppoſe this Operation does confute.

Firſt, He thinks that Women never breed Stones ſo large as Men; the contrary of which ſeems to be manifeſt by this Operation: For perhaps a Stone of ſo large a ſize as this was never yet taken out of the Bladder of a living Man.

Secondly, He ſeems to conclude it probable that all Women may be freed from the Stone by dilation of the Urinary Paſſage, and then forcing away the Stone through it: Which Method I think cannot be depended upon, ſince the Stones may prove of ſo great a ſize.

Thirdly, He ſays, That dividing the Membranous Subſtance of the Bladder, is to be avoided as certain Death to the Patient; whereas this Stone, and many other have proved too large to be extracted through an Inciſion made only within the ſhort Neck of a Woman's Bladder.

The Patient never had the leaſt ill Symptom ſince her being cut, and is now perfectly well.

IV. *Dr.*

IV. *Dr.* Molineux'*s Hiſtorical Account of the late General Coughs and Colds; with ſome Obſervations on other Epidemick Diſtempers.*

AMong the many ſecret workings of Nature, none ſeems more to deſerve our Obſervation, than the riſe and progreſs of Epidemick Diſtempers: Since Health, one of our chiefeſt Goods, is ſo nearly concerned, as to engage us in the Enquiry, and the Intricacy of the Subject may naturally ſtir up our Curioſity to the utmoſt proſecution of it.

The Coughs and Colds that lately ſo univerſally prevailed, give us a moſt extraordinary Inſtance, how liable at certain times our Bodies are, however differing in Conſtitution, Age, and way of Living, to be affected much in the ſame manner by a ſpreading Evil.

The moſt Inſtructive and Uſeful Account that can be given of ſuch a Diſtemper, I take to be the ſetting down all the particular Accidents, or Matter of Fact, that occurr'd in obſerving the way and courſe of its affecting Mens Bodies, rather than to raiſe wild and fruitleſs Speculations in Reaſoning about it, which being Conjectures in all likelihood muſt fall ſhort of the truth, and if ſo, muſt neceſſarily lead us into Error, rather than any way help us in proſecuting our Enquiry.

I ſhall therefore confine my ſelf in the following Hiſtory as cloſe as I can to ſtrict Matter of Fact, paſſing by all Hypotheſes, and ſhall ſet down nothing that was not confirm'd to me by wary and repeated Obſervation.

'Twas about the beginning of *November* laſt, 1693. after a conſtant courſe of moderately warm Weather for the Seaſon, upon ſome Snow falling in the Mountains and Country about the Town, that of a ſudden it grew extreamly cold, and ſoon after ſucceeded ſome few days of very hard Froſt, whereupon Rheums of all kinds, ſuch as violent Coughs that chiefly affected in the Night, great defluxion of thin Rheum at the Noſe and Eyes, immoderate diſcharge of the *Saliva* by ſpitting, hoarſeneſs in the Voice, ſore Throats, with ſome trouble in ſwallowing, wheſings, ſtuffings, and ſoreneſs in the Breaſt, a dull heavineſs and ſtoppage in the Head, with ſuch like Diſorders, the uſual Effects of Cold, ſeized great Numbers of all ſorts of People in *Dublin*.

Some were more violently affected, ſo as to be confined a while to their Beds, thoſe complained of Feveriſh Symptoms, as ſhiverings and chilneſs all over them, that made ſeveral returns, pains in many parts of their Body, ſevere Head-aches, chiefly about their Foreheads, ſo as any Noiſe was very troubleſome; great weakneſs in their Eyes, that the leaſt Light was offenſive; a perfect decay of all Appetite, foul turbid Urine, with a Brick-colour'd Sediment at the bottom; great uneaſineſs and toſſing in their Beds all Night: Yet theſe Diſorders, though they much frightned both the Sick and their Friends, uſually without help of Remedy would abate of themſelves, and terminate in univerſal Sweats, that conſtantly relieved.

This more violent degree of the Cold was more apt I found to fall on ſuch as were given to Exceſs either in Eating or Drinking, or inclinable to a Scrophulous Diſpoſition of Body, than on thoſe that were more temperate, and leſs ſubject to Obſtructions.

When the Cold was but moderate, it uſually was over in Eight or Ten Days, but with thoſe in whom it roſe to a greater height, it continued a Fortnight, three Weeks, and ſometimes above a Month, one way or other it univerſally affected all kinds of Men; thoſe in the Country, as well as City; thoſe that were much abroad in the open Air, and thoſe that ſtay'd much within

Doors, or even kept cloſe in their Chambers; thoſe that were robuſt and hardy, as well as thoſe that were weakly and tender; Men, Women, and Children of all Ranks and Conditions, the youngeſt and the oldeſt; though I think if it were favourable to any ſort, it moſt ſpared thoſe that were very aged, among whom I knew ſeveral that were not the leaſt troubled with it, yet it ſeized ſo univerſally, that not one in Thirty, perhaps I might ſafely ſay more, eſcaped it.

As it firſt appeared towards the beginning of *November*, ſo it ſeemed to arrive to its greateſt degree of violence, and ſpread moſt univerſally about the middle of it; and by the beginning of the Month following it very ſenſibly abated, ſo that very few then complained of their Colds; and 'twas eaſie to obſerve on the Third of *December*, being Sunday, few were heard Coughing in the Churches, whereas a Fortnight before the noiſe of Coughing in every Congregation was very troubleſome, and never out of ones Ears.

So that in the ſpace of four or five Weeks it had its riſe, growth, and decay; and though from firſt to laſt it ſeized ſuch incredible Numbers of all ſorts of Men, I cannot learn that any one truly dyed of it, unleſs ſuch whoſe ſtrength was before ſpent by ſome tedious Fit of Sickneſs, or labour'd under ſome heavier Diſeaſe complicated with it.

I find that about *November* and *December* 1691. by ſome ſhort Notes I took then, Coughs were more than ordinary frequent here in *Dublin*, though nothing comparable to what they were lately; they chiefly then affected Young Children, whoſe Coughs uſually turn'd to a violent Chin-Cough: Yet at this time among all the variety of Coughing Children, I have not met with more than one, that was troubled with a Chin-Cough, and that too was but in a ſlight manner: Which Minute differences in the ways of Epidemick Diſtempers operating in our Bodies, clearly ſhew that their Cauſes cannot be aſcribed only to the ſenſible alterations of the Weather, or the manifeſt qualities of Heat, Cold, Moiſture, or Dryneſs highly predominant in the Air, according to the Vulgar Solution of them, but that they proceed from ſomething more nice and latent than all this.

But to return to our general Cold, it was not only Remarkable for the great Numbers it affected in this Kingdom, but likewiſe for its vaſt extent elſewhere, ſpreading it ſelf all over *England* in the ſame manner it did here, particularly it ſeized them at *London* and *Oxford* as univerſally, and with the ſame Symptoms as it ſeized us in *Dublin*; but with this obſervable difference, that it appeared three or four Weeks ſooner in *London*, that is, about the beginning of *October*, than it did in *Dublin*, where 'twas not the leaſt taken notice of till about the beginning of *November*, as I before mentioned.

Nor was its Progreſs,as I am credibly informed,bounded by theſe Iſlands, for it ſpread it ſelf ſtill further, and reached the Continent, where it infeſted the Northern Parts of *France*, as about *Paris*, *Flanders*, *Holland*, and the reſt of the *United Provinces*, with more violence, and no leſs frequency than it did in theſe Countries; ſo that for its being ſo general in affecting ſuch great Numbers in proportion to the few that eſcaped it, and taking up ſo vaſt a ſcope in its extent, I believe no Epidemick Diſtemper can compare with it; Peſtilential Fevers and the Plague are commonly the moſt ſpreading Diſeaſes, yet we find by their Hiſtories the Infection of 'em uſually limited within much narrower compaſs than this had, as if the ſame Providence had put Bounds to the raging of theſe deadly Diſtempers, as it has done to the Sea; for were they as univerſal and diffuſive of themſelves as theſe ſlighter Diſeaſes are, they would entirely diſpeople whole Kingdoms, and ſoon leave the World waſte and deſtitute of Mankind.

No Example of any Epidemick Diſtemper ſeems in all reſpects to come nearer in competition with our late general Cold, than the tranſient Fever, that ſo ſtrangely in the Year 1688 prevailed in theſe Countries, which I look upon to have been the moſt univerſal Fever, as this the moſt univerſal Cold, that perhaps has ever appeared; ſo that it will not be improper to inſert here the Hiſtory in ſhort of that Remarkable Diſtemper.

About the beginning of *July* 1688. this ſhort ſort of Fever was firſt obſerved to appear here in *Dublin*, it ſo univerſally ſeized all ſorts of Men whatever, that I then made an eſtimate not above one in fifteen eſcaped. It began, as generally Fevers do, with a chilneſs and ſhivering all over, like that of an Ague, but not ſo violent, which ſoon broke out into a dry burning Heat, with great uneaſineſs that commonly confin'd them to their Beds, where they paſſed the enſuing Night very reſtleſs; they complain'd likewiſe of Giddineſs, and a dull pain in their Heads, chiefly about their Eyes, with unſettled pains in their Limbs, and about the ſmall of their Back, a ſoreneſs all over their Fleſh, a loſs of Appetite, with a *Nauſea* or aptneſs to Vomit, an unuſual ill taſt in their Mouths, yet little or no Thirſt: And tho' theſe Symptoms were very violent for a time, yet they did not continue long, for about the ſecond day of the Diſtemper the Patient uſually of himſelf fell into a Sweat, (unleſs 'twas prevented by letting Blood, which however beneficial in other Fevers, I found manifeſtly retarded the Progreſs of this) and if the Sweat was encouraged for five or ſix hours by laying on more Cloaths, or taking ſome Sudorifick Medicine, moſt of the Diſorders before mentioned would entirely diſappear, or at leaſt very much abate.

The Giddineſs of their Head, and want of Appetite would often continue ſome days afterwards, but with the uſe of the open freſh Air they certainly in four or five days at fartheſt recover'd theſe likewiſe, and were perfectly well; ſo tranſient and favourable was this Diſeaſe, that it ſeldom required the help of a Phyſician; and of a Thouſand that were ſeized with it, I believe ſcarce one dyed; by the middle of *Auguſt* following it wholly diſappeared, ſo that it had run its full Courſe through all ſorts of People in ſeven Weeks time.

'Twas very Remarkable that in *England* as well as this Kingdom, a ſhort time before this General Fever, a ſlight Diſeaſe, but very univerſal, ſeized the Horſes too: In them it ſhewed it ſelf by a great defluxion of Rheum from their Noſes; and I was aſſured by a Judicious Man, an Officer in the Army of *Ireland*, which was then drawn out, and encamp'd on the *Curragh* of *Kildare*, there were not Ten Horſes in a Regiment that had not this diſorder; which ſhews the cauſe of ſpreading Diſtempers to be ſo prevalent, that it works not only on the finer and more delicate Compoſition of Humane Bodies, but affects even the more ſtrong and groſs frame of one of the moſt robuſt Animal Productions in Nature; but this by the by.

This Fever as we were ſpeaking of, as our late Colds, ſpread it ſelf all over *England*; whether it extended farther I did not learn, but it raged as generally in *London*, as I was informed by a learned Phyſician from thence, as it did with us here in *Dublin*, and with the ſame concourſe of Symptoms, but with ſome difference of time in relation to its firſt appearance; for whereas they began to take notice of it at *London* about the middle of *May*, and it continued there till about the latter end of *June*; it did not ſhew it ſelf here in *Dublin* till the beginning of *July*, after it had wholly diſappeared in *London*. So likewiſe our late general Colds, as I before mentioned, were obſerved to keep ſuch a ſort of Regular Precedence of Time, as to their riſe and fall at *London*, in reſpect of *Dublin:* Whence one may reaſonably gather, that theſe ſpreading Epidemick Diſtempers take their Progreſs from Eaſt to Weſt. But this ſhould be further confirmed by more frequent Obſervations before one may ſafely determine any thing in this matter; however, that it held true in the two foregoing Inſtances is certain; and 'tis not leſs certain that the Plague and Peſtilential Fevers rage more frequently in the Eaſt towards *Conſtantinople* and the *Levant*, than in theſe more Weſtern Parts of *Europe*, as if that ſeemed a more Natural Clime for their riſe and propagation; whence the ſeveral Eſtates of *Italy* ſo uſually impoſe on Ships coming from all Parts of *Turkey* into their Ports the ſtrict obſerving a *Quarantine*, before they Land either their Paſſengers, or their Goods.

And this might lead us to Diſcourſe ſomething concerning the cauſe of theſe ſort of ſpreading Diſtempers: But till we have a better ſtock of more accurate Hiſtories of them, and be further acquainted with their Nature and Progreſs, I do not think it ſo proper to the Deſign of thoſe that candidly proſecute Philoſophical Enquiries to determine any thing as yet in this Point.

T. M.

V. *Of a Stone found in the Gall-Bladder of a Woman.* *By Mr.* J. T.

AFter throwing up the *Sternon*, and inſpecting the Parts contained in the Cavity of the Breaſt, I found the Lobes of the Lungs extreamly turgid, and its Veſicles impleat with a grumous Blood, their inveſting Membrane in the upper part adhered fimly to the *Pleura*: The right Ventricle of the Heart was filled with a large quantity of coagulated Blood, but the left ſeemed exſanguious:

I took but a curſory view of theſe Parts, but yet could not but obſerve a ſtagnation, and great extravaſation of Blood upon the right ſide of the *Pleura.*

Beneath the *Diaphragm*, or in the Cavity of the *Abdomen*, I found the Ventricle and Inteſtines much inflated, the *Omentum* fair and large, the Spleen to Admiration ſo augmented in bulk, that according to the moſt conſiderate poiſe, I could not ſuppoſe it to weigh leſs than two or three Phyſical Pounds: Upon cutting through its body, there was diſcharged ſeveral Ounces of a very fætid and putrified Blood. The Liver alſo was much larger than uſual,but its *Parenchyma* firm and ſound. When I came to ſurvey the Concave part of this Bowel, I beheld as I thought, the *Veſica bilaria* full of Bile; but more curiouſly examining of it by the touch, I found by the interpoſition of a ſolid Body, that there was ſomething preternatural ingendred within its Cavity: To be ſatisfied of this, I opened the *Veſica*, and with my *Forceps* extracted a Stone very beautifully cruſted over with chryſtallized Salts of various Figures, *Conical*, *Cubical*, *Pyramidal*, &c. The one half of it lay immerſt in Bile, whoſe quantity was inconſiderable; for indeed this Lapidious Concretion took up the whole Cavity of the Bladder, and weighed immediately after it was taken from its Receptacle, two Drams fifteen Grains.

We diſcovered in one of the Kidneys a large *Abſceſs*, and diſcharged a great quantity of Wheyiſh Matter.

Theſe were the moſt obſervable Remarks taken at the diſſection of this Body. But perhaps there was as much Ignorance diſcovered in thoſe who treated her under her Indiſpoſition as has been heard off: For notwithſtanding ſhe had been infeſted for ſeveral days with an *Hæmoptoë*, had all the apparent Symptoms of a *Peripneumony* and *Pleuriſy*, yet falling into the Hands of ſome Empirical Chymiater of the Town, *Venæſection* was omitted, and utterly forbid, as a uſeleſs and unſerviceable Remedy.

An

An Account of BOOKS.

I. *Tractatus Mathematicus de Figurarum Curvilinearum Quadraturis & Locis Geometricis. Autore* Johanne Craig. Londini *apud* Sam. Smith & Benj. Walford, *Soc. Regiæ Typographos.*

THis Treatiſe conſiſts of two Heads. In the Firſt the Author undertakes to give a General Method for determining the Quadratures of Curvilinear Spaces, and this he ſhews may always be done by finding another Curve-line from the known Property of its Tangent; which Curve-line he therefore calls the *Quadratrix* of the propoſed Space. Now this *Quadratrix* (for all Spaces comprehended by Geometrical Curves) is either a Geometrical or a Mechanical Cure-line: And accordingly he divides the whole into two Parts. In the Firſt of theſe he treats of ſuch *Spaces*, whoſe *Quadratrix's* are Geometrical Curves, where he Illuſtrates his Method by a great variety of Examples; diſcovering in ſeveral of them a new Method of finding Infinite *Series's* (without the trouble of Diviſion or Extraction of Roots) by aſſuming an Arbitrary *Series* with unknown Coefficients, which are eaſily determined in the Progreſs of the Problem. And ſince the Publication of this Treatiſe we have ſome Inſtances of the like Method of finding *Series's* by that excellent Mathematician, Mr. *Leibnitz*, Printed in the *Acta Eruditorum* of *April*, 1693. Afterwards he gives a Method of comparing the *Area's* of Figures with the ſimpleſt Figures of the ſame kind; from which he deduces many Theorems, each of which do exhibit the Quadratures of an Infinity of Figures without any trouble of Calculation: And withal ſhewing to what Theorem any propoſed Figure is to be referred, and how the like Theorems may be continued by the help of his general Method. He concludes this Firſt Part with a Diſcourſe concerning the Analytical Expreſſion of Quadratures, wherein is ſhewn, that though the *Area* anſwering to the *Abſciſſa* be that which is commonly ſought, yet the general Quadrature found by his Method, is for the moſt part either greater or leſſer: Therefore he gives both a Geometrical and Analytical Rule for knowing whether the ſaid general Quadrature be deficient or exceeding, and what that deficient or exceeding Quantity is.

The Second Part treats of the Quadratures of thoſe Spaces, whoſe *Quadratrix's* are *Mechanical* or Tranſcendent Curves, as he (after Mr. *Leibnitz*) chooſes rather to call them; where he gives a general Method for finding their Tangents. And having given a Rule for defining the Tranſcendent Quadratrix of any Algebraical Curve (that is not capable of a Geometrical one) he Illuſtrates the ſame by finding the Tranſcendent Quadratures of the Circle, *Hyperbola*, and two other Figures.

There is added at the end, the Author's Anſwer to a Letter of Mr. *D. T*'s. relating to a Controverſie between them concerning a Method of Quadratures, publiſhed by Mr. *D. T.* in the *Acta Eruditorum.*

The Second Head of this Treatiſe is concerning the *Geometrical Places*, wherein is ſhewn how to determine any *Solid Place*, by comparing the Equation with a general *Theorem* comprehending all Places of that kind: Whereby are avoided all thoſe many Rules about the Reduction of the given Equation, and the variety of the Signs + and —, which have hitherto rendred this Piece of Geometry ſo troubleſom.

II. *The Hiſtory of the* Church *of* Malabar, *from the time of its being Diſcovered by the* Portuguezes *in the Year* 1501. *Giving an Account of the Perſecutions and violent Methods of the* Roman *Prelates to reduce them to the Subjection of the Church of* Rome, *together with the* Synod *of* Diamper, *celebrated* Anno 1599. *With ſome Remarks upon the* Faith *and* Doctrine *of the Chriſtians of St.* Thomas *in the* Indies, *agreeing with the* Church *of* England, *in Oppoſition to that of* Rome: *Done out of* Portuguez *into* Engliſh *by* Michael Geddes, *Chancellor of the Cathedral Church of* Sarum. Lond. *Printed for* S. Smith *and* B. Walford. *In Octavo.* 1694.

THE Author of this Hiſtory begins with a ſhort Account of the Country of *Malabar*, as to its Situation, its Kingdoms, and Ports, moſtly inhabited by Heathens, only the South end of the *Serra* or *Gate*, a Ridge of Mountains running 200 Leagues North and South, is Inhabited by *Chriſtians*, as they call themſelves of St. *Thomas*, which Apoſtle, they ſay, firſt converted them. They have been for 1300 Years under the *Patriarch* of *Babylon*. Next, he ſhews us how the firſt News of them came to *Portugal*, *Anno* 1501. and upon what Account they begged the *Portuguez* Aſſiſtance againſt the Infidels. *Anno* 1505. two Chriſtians ſent by the *Venetians*, taught the *Indians* the uſe of Great Guns, thereby to oppoſe the *Portuguez* and their Trade there. Till about the Year 1544. little more was heard of them, at which time the Croſs, and other pretended Reliques of St. *Thomas* were found at *Meliapor*, of which the Author gives the Legend, which leads him to give an Account of the Violences uſed by the *Roman Catholicks* to bring them to the Obedience of their Church, for that purpoſe erecting a Colledge at *Cranganor*, *Anno* 1546. and in the Year 1587. another to Inſtruct them in the *Chaldee* and *Syriack* Tongues. The Extreams they there made uſe of, as the Author Obſerves, had like to have coſt them all that they had in the *Indies*, and was the greateſt cauſe of the War between the *Portuguez* and the *Indians*. There are ſeveral Remarkable Paſſages of the Jeſuites Contrivances, and the *Indians* Reſentment thereof, for which I refer to the Book, as leſs proper to our Deſign. The Author ſhews the Doctrines wherein the *Church* of *Malabar* agrees with that of *England*, and differs from the *Roman*. And concludes with the Acts and Decrees of the *Synod* of *Diamper*, with the occaſion of its being called; which, with a Preface to a *Miſſal* impoſed upon that Church by the Arch-Biſhop *Menezes*, ends the whole Book.

ERRATA. Numb. 208.

Page 48. line 23. read *Hynnon Dhewi*, or *Phynnon Dhewi*. pag. 49. l. 17. r. *Harlech*. pag. 70. l. 17. r. $58\frac{1}{2}$.

LONDON:

Printed for *Sam. Smith*, and *Benj. Walford*, Printers to
the *Royal Society*, at the Prince's Arms in St. *Paul's*
Church-yard. 1694.

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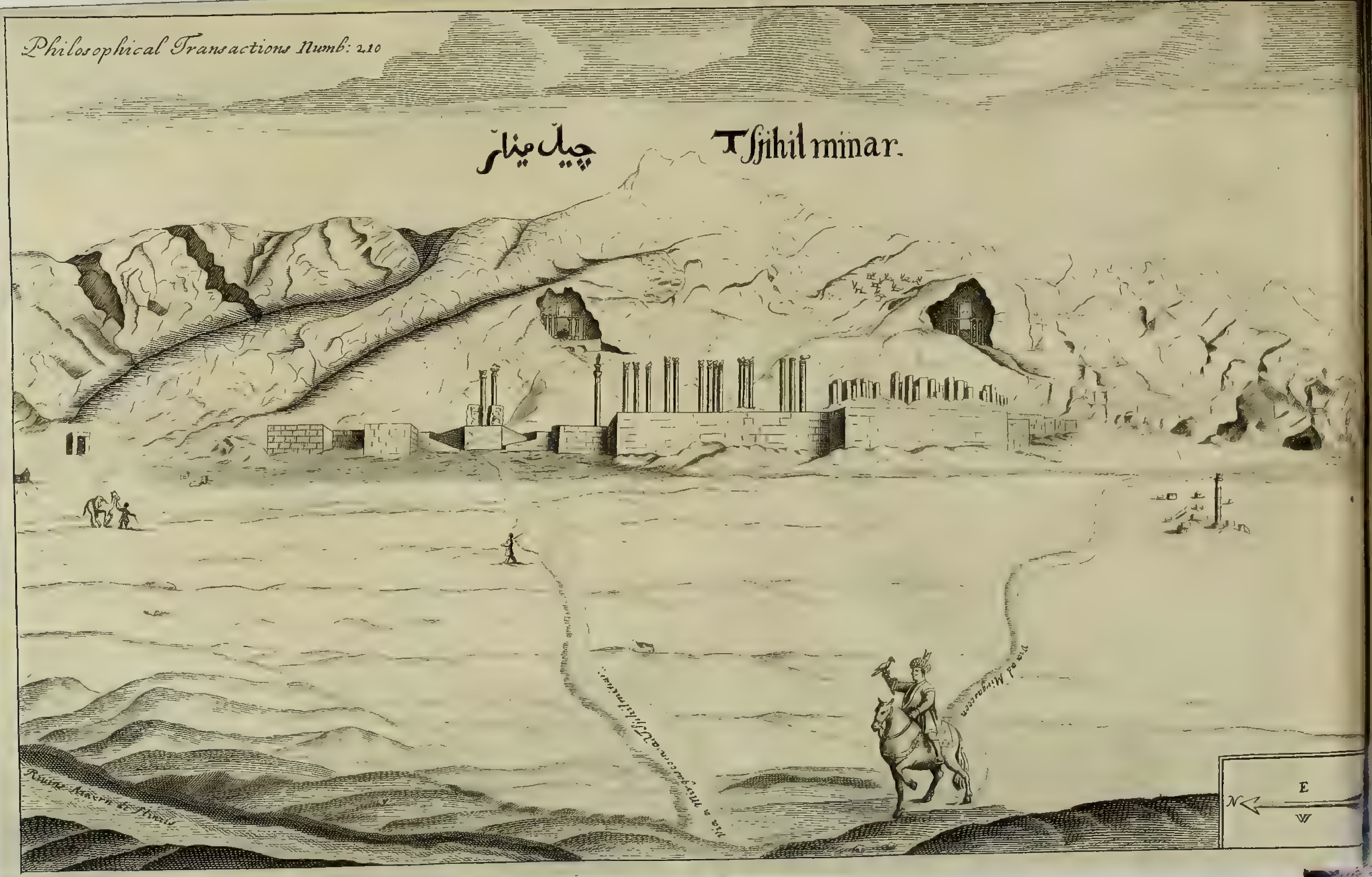
Philosophical Transactions Numb: 210
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Tſjihil minar.
Via a Mirgascon. ad Tſjihilminar:
Via ad Mirgascon
Rivus Araxes et Thnis
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PHILOSOPHICAL TRANSACTIONS.

For the Month of May, 1694.

The CONTENTS.

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I. *A Letter from Monſieur* N. Witſen *to Dr.* Martin Liſter, *with two Draughts of the Famous* Perſepolis.

THIS Ingenious and Inquiſitive Gentleman having already often obliged the World with Communications of his Diſcoveries, lately ſent the following Letter with the Draughts to *Dr. Liſter*, who was pleaſed to permit their Publication in theſe Tracts: The greatneſs of the Curioſity we hope will recommend them to the Lovers of Antiquity, little of thoſe Famous Remains having been yet publiſht, and thoſe that have been, but ill deſigned or graved. Monſieur *Witſen*'s Letter, tranſlated from the *French*, is as follows.

SIR,

SIR,

SInce I had the Honour of receiving your laſt, there came to my hands ſeveral Curious *Shells* from you, with a piece of *Engliſh Agate*, and the Tranſactions of the *Royal Society* for the Month of *June* laſt, for which Favours I return my Humble Thanks. As to the *Cockles* of the *Caſpian* Sea, and from the Mouth of *Wolga*, I have Advice from *Moſcou*, that they are expected there this Winter: Meanwhile I herewith ſend you ſome *Snail-Shells*, taken out of the River *Jaute*, not far from the City of *Moſcou*. Our *Apothecaries* make uſe of them powdered, and probably for the ſame purpoſe as *Crabs-Eyes*. There are ſome others likewiſe which are found in the Rivers of *Moſcou* and *Neglina*, and in the *Wolga*. Since you have been pleaſed to communicate to me an Inſcription found at *Perſepolis*, I thought it would be acceptable to ſend you the Draughts of part of the Ruins of the Stone-work of that Proud Palace, given me by the Perſon himſelf that drew them upon the place. I ſhould be much ſatisfied had I any thing worthy of your Curioſity and the Publick, which you ſo often Oblige with your Diſcoveries, which juſtly merit mine and the Thanks of all that eſteem them as much as my ſelf, who am the Cheriſher of your Friendſhip, and deſirous to ſhew that I am,

SIR,

Your most Humble and Obedient Servant,

Amſterdam,
Jan. 1. 1694.

N. Witſen.

II. *Dr.* Gwither's *Diſcourſe of* Phyſiognomy. *Communicated by Mr.* Owen Lloyd, *Secretary of the Philoſophical* Society *at* Dublin.

I*Ndex animi vultus,* is a ſaying frequent in the Mouth of every Pedant, and every Fortune-telling *Charletain* pretends to read a Man's Face, as the *Aſtrologer* does Heaven's.

All that ſort have looked upon the Doctrine of *Phyſiognomy* as a great truth handed down by Infallible Antiquity, ſo never troubled themſelves to deviſe any *Hypotheſis* but what was more ridiculous than Judicial *Aſtrology* its Parent, or *Roſycrucian* lore; or to aſſign any Intelligible Natural Cauſes, for a Foundation of ſuch an uſeful Knowledge, as might in ſome meaſure ſupply the defect of the ſo much wiſh'd Window of the Philoſopher, in Man's Breaſt. This made moſt Men reject it as a Folly, and oppoſe one old ſaying by another, never making an eſtimate of a Man's Parts, or Temper on ſight, unleſs the Fool, or Gallows were very legible. But upon ſtrict Enquiry I find reaſon to conclude that a ſober Naturaliſt may find much truth in that Art, which may be uſeful, and well ſolve all its *Phænomena* intelligibly, which has not been done by any one that I know; and if any of this learned Company have met with any, I deſire they may here put a ſtop to this Diſcourſe, that I may not offend by inſipid Repetition.

Soft Wax cannot receive more numerous and various Impreſſions, than are imprinted on Man's Face by Objects moving his Affections, and not only the Objects themſelves have this Power, but alſo the very Images, or *Idea's*: that is to ſay, any thing that puts the Animal Spirits into the ſame motion that the Object preſent did, will have the ſame Effect with the Object; to prove the firſt, let one obſerve a Man's Face looking on a Pitiful Object, then a Ridiculous, then a Strange, then on a Terrible or Dangerous Object, and ſo forth; for the ſecond, that *Idea's* have the ſame Effect with Objects real, Dreams confirm too often; and *Virgil* can in a little time make one Face repreſent Shame, Fear, Love, Anger, Sorrow, *&c.*

The manner I conceive to be thus, the Animal Spirits moved in the Senſory by an Object, continue their motion to the Brain, whence the motion is propagated to this or that particular part of the Body as is moſt ſuitable to the deſign of its Creation, having firſt made an alteration in the Face by its Nerves, eſpecially the *Pathetick*, and *Oculorum motorii*, actuating its many Muſcles, as the Dial-plate to that ſtupendious piece of Clock-work, which ſhews what is to be expected next from the ſtriking part: Not that I think the motion of the Spirits in the Senſory continued by the impreſſion of the Object, all the way, as from a Finger to the Foot; I know it too weak, though the tenſeneſs of the Nerves favour it: but I conceive it done in the *Medulla* of the Brain, where is the common ſtock of Spirits; as in an Organ, whoſe Pipes being uncovered, the Air ruſhes into them, but the Keys let go, are ſtopt again: Now if by repeated Acts or frequent entertaining of the *Idea's* of a favourite Paſſion or Vice, which Natural Temperament has hurry'd one to, or Cuſtom dragg'd, the Face is ſo often put into that poſture which attends ſuch Acts, that the Animal Spirits find ſuch patent paſſages into its Nerves, that it is ſometimes unalterably ſet, (as the *Indian* Religious are, by long continuing in ſtrange Poſtures in their *Pagods*,) but moſt commonly ſuch a Habit is contracted, that it falls inſenſibly into that Poſture, when ſome preſent Object does not obliterate that more Natural Impreſſion by a new, or diſſimulation hide it: Hence it is that we ſee great Drinkers with Eyes generally ſet towards the Noſe, the adducent Muſcles being often employed to let them ſee their loved Liquor in the Glaſs, in the time of drinking; which were therefore called *Bibitory*; Laſcivious Perſons are Remarkable for the *Oculorum mobilis petulantia*, as *Petronius* calls it. From this alſo we may ſolve the *Quakers* expecting Face waiting the pretended Spirit, and the *Melancholy* Face of the *Sectaries*, the Studious Face of Men of great Application of Mind, Revengeful and Bloody Men like Executioners in the Act; and though Silence in a ſort may a while paſs for Wiſdom, yet ſooner or later Sir *Martin* peeps through the Diſguiſe to undo all. A changeable Face I have obſerved to ſhew a changeable Mind. But I would by no means have what has been ſaid underſtood as without exception, for I doubt not but ſometimes there are found Men with great and vertuous Souls under unpromiſing outſides, as if Nature deſigned to ſhew, what *Seneca* ſaid of his Friend *Claranus*, *Ut approbet virtutem omni loco naſci*. And a little after, *Claranus mihi videtur in exemplum editus, ut ſcire poſſemus non deformitate corporis fœdari animum, ſed pulchritudine animi corpus ornari.*

III. *A Continuation of* Mr. John Clayton'*s Account of* Virginia.

Of the Beaſts of Virginia.

THERE were neither Horſes, Bulls, Cows, Sheep, or Swine, in all the Country, before the coming of the *Engliſh*, as I have heard, and have much reaſon to believe. But now amongſt the *Engliſh* Inhabitants there are good ſtore of Horſes, though they are very negligent and careleſs about the Breed: It is true, there is a Law, that no Horſe ſhall be kept ſtoned under a certain ſize, but it is not put in Execution. Such as they are, there are good ſtore, and as cheap or cheaper than in *England*, worth about Five Pounds apiece. They never Shoe them, nor Stable them in general; ſome few Gentlemen may be ſomething more Curious, but it is very rare; yet they Ride pretty ſharply, a Planter's Pace is a Proverb, which is a good ſharp Hand-Gallop. The *Indians* have not yet learned to Ride, only the King of *Pomonkie* had got three or four Horſes for his own Saddle, and an Attendant, which I think ſhould in no wiſe be indulged, for I look on the allowing them Horſes much more dangerous than even Guns and Powder.

See *Philoſ. Tranſact.* Numb. 201, 205, 206.

Wild Bulls and *Cows* there are now in the uninhabited Parts, but ſuch only as have been bred from ſome that have ſtrayed, and become Wild, and have propagated their kind, and are difficult to be ſhot, having a great Acuteneſs of Smelling. The Common Rate of a Cow and Calf, is 50 *s.* ſight unſeen, be ſhe big or little, they are never very Curious to Examine that Point.

Their *Sheep* are of a midling ſize, pretty fine fleeced in general, and moſt Perſons of Eſtate begin to keep

Flocks, which hitherto has not been much regarded, becauſe of the Wolves that deſtroy them; ſo that a piece of Mutton is a finer Treat, than either Veniſon, Wild-Gooſe, Duck, Widgeon, or Teal.

Elke, I have heard of them beyond the Inhabitants, and that there was one preſented to Sir *William Berkley*, which he ſometime kept.

Deer, there are abundance of brave Red Deer, ſo that a good Woodſman, as they call them, will keep a Houſe with Veniſon; the *Indians*, they ſay, make Artificial ſorts of Heads of Boughs of Trees, which they Conſecrate to their Gods, and theſe they put on to deceive the Deer when they go a Shooting, or Hunting, as they call it, and by mimiking the feeding of the Deer, they by degrees get within Shot.

Swine, they have now in great abundance, Shoats, or Porkrels are their general Food; and I believe as good as any *Weſtphalia*, certainly far exceeding our *Engliſh*.

Rackoone, I take it to be a Species of a Monky, ſomething leſs than a Fox, gray-hair'd, its Feet formed like a Hand, and the Face too has likewiſe the reſemblance of a Monkies, beſides being kept tame, they are very Apiſh; They are very prejudicial to their Poultrey, as I remember.

An *Opoſſom*, as big, and ſomething ſhaped like our Badgers, but of a lighter Dun colour, with a long Tail ſomething like a Rat, but as thick as a Man's Thumb; the Skin of its Belly is very large, and folded ſo as to meet like a Purſe, wherein they ſecure their Young whilſt little and tender, which will as naturally run thither, as Chickens to a Hen; in theſe falſe Bellies they will carry their Young; theſe alſo feed on, and devour Corn.

Hares, many will have them to be a Hedge-Rabbet, but I know not what they mean thereby. I take them to be a perfect Species of Hares, becauſe I have ſeen

Leverets there with the white ſpot in the Head, which the Old ones have not, ſo it is in *England*; and the Down is perfectly of the colour of our Hares,they ſit as our Hares do, and make no Holes and Burrows in the Earth; true, they are but about the bigneſs of an *Engliſh* Rabbet, and run no faſter; they generally take into ſome hollow Tree within a little ſpace, which then the People catch by gathering the withered Leaves, and ſetting them on fire within the hollow of the Tree, and ſmoaking of them ſo till they fall down. Sometimes they take long Bryars, and twiſt them in the Down and Skin, and ſo pull them forth.

Squirrels, there are three ſorts. The firſt is the great Fox Squirrel, much larger than the *Engliſh*, and gray, almoſt as a common Rabbet. Theſe are very common, I have eaten of them at the beſt Gentlemens Tables, and they are as good as a Rabbet. The Second is the Flying Squirrel, of a lighter Dun colour, and much leſs than the *Engliſh* Squirrel; the Skin on either ſide the Belly extended is very large betwixt the fore-leg and hind-leg, which helps them much in their skipping from one Bough to another, that they will leap farther than the Fox-Squirrel, though much leſs, yet this is ſtill rather skipping than flying, though the diſtinction be well enough. The Third is the Ground-Squirrel, I never ſaw any of this ſort, only I have been told of them, and have had them thus deſcribed to me, to be little bigger than a Mouſe, finely ſpotted like a young Fawn; by what I further apprehended, they are an abſolute ſort of Dor-Mouſe, only different in colour.

Musk-Rats, in all things ſhaped like our Water-Rats, only ſomething larger, and is an abſolute Species of Water-Rats, only having a curious Musky ſcent: I kept one for a certain time in a wooden Cheſt; two days before it dyed it was extraordinary Odoriferous, and ſented the Room very much; but the day that it dyed, and a day after the ſcent was very ſmall, yet afterwards the Skin was very fragrant; the Stones alſo ſmelt very well. They build Houſes as Beavers do, in the Marſhes, and Swamps (as they there call them) by the Water-ſides, with two or three ways into them, and they are finely daubed within; I pulled one in pieces purpoſely to ſee the Contrivance: There were three different Lodging Rooms, very neat, one higher than another, as I conceive purpoſely made for Retirement, when the Water riſes higher than ordinary; they are conſiderably large, having much Traſh and Lumbre to make their Houſes withal, I ſuppoſe they live moſtly on Fiſh.

Batts, as I remember at leaſt two ſorts; one a large ſort with long Ears, and particularly long ſtragling hairs. The other much like the *Engliſh*, ſomething larger I think, very common.

I never heard of any *Lions*, they told me of a Creature killed whilſt I was there, in *Glceſter* County, which I conceived to be a ſort of Pard, or Tyger.

Bears there are, and yet but few in the Inhabited part of *Virginia*; towards *Carolina* there are many more. There was a ſmall Bear killed within three Miles of *James City* the Year that I left the Country, but it was ſuppoſed to have ſtrayed, and ſwam over *James River*. They are not very fierce, their Fleſh is commended for a very Rich ſort of Pork, but the lying ſide of the Bear, as I remember, is but half the value of the other, weight for weight.

There are ſeveral ſorts of *Wild Cats*, and *Poll-Cats*.

Beavers build their Houſes in like manner as the Musk-Rats do, only much larger, and with pieces of Timber make Dams over Rivers; as I ſuppoſe either to preſerve their Furrs dry in their paſſage over the Rivers, otherwiſe to catch Fiſh by ſtanding to watch them thereon, and jumping upon them on a ſudden; they are very ſubtil Creatures, and if half of the Stories be true that I have been told, they have a very Orderly Government amongſt them; in their Works each knows his proper Work, and Station, and the Overſeers beat thoſe Young Ones that loiter in their Buſineſs, and will make them cry, and work ſtoutly.

Wolves there are great ſtore; you may hear a Company Hunting in an Evening, and yelping like a pack of Beagles; but they are very cowardly, and dare ſcarce venture on any thing that faces them, yet if Hungry, will pull down a good large Sheep that flies from them. I never heard that any of them adventured to ſet on Man or Child.

Foxes, they are very much like ours, only their Furr is much more grizled, or gray; neither do I remember ever to have ſeen any Fox-holes, but of this I am not poſitive.

Every Houſe keeps three or four Mungrel *Dogs* to deſtroy Vermin, ſuch as *Wolves*, *Foxes*, *Rackoons*, *Opoſſoms*, &c. But they never Hunt with Hounds, I ſuppoſe, becauſe there are ſo many Branches of Rivers, that they cannot follow them. Neither do they keep Grey-Hounds, becauſe they ſay, that they are ſubject to break their Necks by running againſt Trees, and any Cur will ſerve to run their Hares into a hollow Tree, where after the aforeſaid manner they catch them.

They have great ſtore both of Land and Water *Tortoiſes*, but they are very ſmall, I think I never ſaw any in that Country to exceed a Foot in length; there is alſo another ſort of Land-Tortoiſe, different from the common ſort, with a higher ridged Back, and ſpeckled with red ſort of Spots.

Frogs they have of ſeveral ſorts, one of a Prodigious largeneſs, Eight or Ten times as big as any in *England*, and it makes a ſtrange noiſe, ſomething like the Bellowing of a Bull, or betwixt that, and the hollow ſounding noiſe that the *Engliſh* Bittern makes.

Another very common ſort, which they call *Toads*, becauſe black, but I think differs nothing from our black Frog. They have Toads alſo like ours in *England*; and another ſmall ſort of Frog, whick makes a noiſe like Pack-Horſe Bells all the Spring long. Another little green Frog, that will leap prodigiouſly, which they therefore call the Flying Frog. There is frequently heard in the Woods a ſhrill ſort of noiſe, much like that which our Shrew-Mouſe makes, but much ſharper; I could never learn the certainty what it was that made this noiſe, it is generally in a Tree, and ſome have aſſerted to me, that it was made by the green Frog, yet I ſcarcely believe it. Mr. *Baniſter* aſſured me it was made by a ſort of *Scarabeus* Beetle, that is I think full as big as the Humming-Bird; but neither do I believe that, and for this Reaſon, for I never ſaw that Beetle ſo low as the Salts, but always as high up in the Country as the Freſhes, and that noiſe is frequent all over the Country.

Lizards, that are gray, and very common, the Snakes feed much on them, for I have taken ſeveral of them out of the bellies of Snakes.

Snakes about ſeven ſeveral ſorts. The Rattle-Snake, ſo called from certain Rattles at the end of the Tail; theſe Rattles ſeem like ſo many periſhed Joynts, being a dry Husk over certain Joynts, and the common Opinion is, that there are as many Rattles or Joynts, as the Snake is Years old; I kill'd four or five, and they had each eleven, twelve, or thirteen Joynts each, but the Young ones have no Rattles of a Year or two, but they may be known notwithſtanding, being very regularly diced or checker'd, black, and gray on the backs: The Old ſhake and ſhiver theſe Rattles with wonderful nimbleneſs when they are any ways diſturbed; their bite is very deadly, yet not always of the ſame force, but more or leſs Mortal, accordingly as the Snake is in force or vigour; and therefore in *June* or *July* much worſe, and more Mortal, than in *March* and *April.* This Snake is a very Majeſtick ſort of Creature, and will ſcarce meddle with any thing unleſs provoked, but if any thing offend it, it makes directly at them. I was told a pleaſant Story of an Old Gentleman, Col. *Cleyborn* as I remember was his Name, the ſame that ſent the Rattle-Snakes to the *Royal Society* ſome Years ſince. He had an odd Fancy of keeping ſome of theſe Snakes always in Barrels in the Houſe, and one time an *Indian* pretending to Charm them ſo as to take them by the Neck in his hand without biting of him; the Old Gentleman cauſed a Rattle-Snake to be brought forth, the *Indian* began his Charm with a little Wand, whisking it round and round the Rattle-Snake's Head, bringing it by degrees nigher and nigher, and at length flung the Switch away, and whisked his Han about in like manner, bringing his Hand nigher ſtill and nigher, by taking leſs Circles, when the Old Gentleman immediately hit the Snake with his Crutch, and the Snake ſnap'd the *Indian* by the Hand, and bit him very ſharply betwixt the Fingers, which put his Charm to an end, and he roared out; but ſtretch'd his Arm out as high as he could, calling for a ſtring, wherewith he bound his Arm as hard as poſſibly he could, and clapt a hot burning Coal thereon, and ſinged it ſtoutly, whereby he was cured, but looked pale a long while after. And I believe this truly one of the beſt ways in the World of Curing the Bite either of Viper or Mad Dog. I was with the Honourable Eſquire *Boyle*, when he made certain Experiments of Curing the Bite of Vipers, with certain *Eaſt-India* Snake-ſtones, that were ſent him by King *James* the Second, the Queen, and ſome of the Nobility, purpoſely to have him try their Vertue and Efficacy: For that end he got ſome brisk Vipers, and made them bite the Thighs of certain Pullets, and the

Breaſts of others; he applyed nothing to one of the Pullets, and it dyed within three Minutes and a half, as I remember; but I think they all recovered to which he applyed the Snake-ſtones, though they turned wonderful pale, their Combs, &c. immediately, and they became extream ſick, and purged within half an hour, and the next Morning all their Fleſh was turned green to a wonder, nevertheleſs they recovered by degrees: The manner of the Application was only by laying on the Stone, and by two croſs-bits of a very ſticking *Diaculum* Plaiſter binding it on, which he let not lye on paſt an hour or two, but I think not ſo long, took the Stone off, and put it into Milk for ſome time; ſome Stones were of much ſtronger Vertue than others. I propoſed a piece of unquench'd Lime-ſtone to be apply'd to ſee whether it might not prove as powerful, but know not whether ever it was tryed; but here on telling Mr. *Boyle* the Story of this *Indian*, he approved the Method of Cure, and ſaid, an actual Cautery was the moſt certain Cure. The Poiſon, both of Viper and Mad-Dog (as I conceive) kill by thickning of the Blood, after the manner that Runnet congeals Milk when they make Cheeſe. Vipers, and all the Viperous Brood, as Rattle-Snakes, &c. that are deadly, have I believe their Poiſonous Teeth Fiſtulous, for ſo I have obſerved that Vipers Teeth are, and the Rattle-Snakes very remarkable, and therefore they kill ſo very ſpeedily by injecting the Poiſon through thoſe Fiſtulous Teeth into the very Maſs of Blood; but the Bite of Mad-Dogs is oft of long continuance before it get into and corrupt the Maſs of Blood, being it ſticks only to the out-ſides of the Teeth, and therefore when they bite through any thickneſs of Cloaths, it rarely proves Mortal, the Cloaths wiping the Poiſon off before it come to the Fleſh. A Girle that was bit about *New-Years Day*, continued well till *Whitſontide*, when coming to ſee certain Friends in our Parts, ſhe fell very ill, and being a Poor Girle, they came to me: it pleaſed God I recovered her. Sometime after ſhe returned to give me thanks for ſaving her Life, being two Perſons that were bit with the ſame Dog, were dead, whilſt ſhe remained under Cure, and therefore ſhe was the fullier convinced ſhe owed her Life to me; but of this I ſhall give a more particular Inſtance by and by. But the Poiſons of Vipers ſeems to be like the injecting of Liquors into the Veins of Creatures: Dr. *Moulin* and I made many Experiments of this Nature together, and I have made many more by my ſelf. We once I remember injected half a Dram of Allom into the Jugular-Vein of a Dog before the *Royal Society*, (the Allom being only diſſolved in a little Water) which within ſomething leſs than one Minutes time was ſo abſoluely dead, as not to have the leaſt Convulſive Motion; and I have done the like with many other things beſides Allom, but with ſome things it is more curdled and broken, than with others; and will differ much both as to colour and conſiſtence. Salt-Petre kills much as quickly as Allom, but then the Blood in the Heart looks very florid, ſmooth, and even. I wiſh ſome Perſon of Obſervation and Leiſure would proſecute theſe ſorts of Experiments, and make Injections of the ſeveral things moſt uſed in Phyſick into the Veins of Creatures, both in different quantities, and into different Veins, as into the Thigh-veins of ſome Dogs, and Jugulars of ſome others, and in much leſſer quantities of ſuch things as kill ſuddenly; for in the little time I have ſpent in theſe ſorts of Experiments, I eaſily perceive notable Diſcoveries might be made thereby: One Dog that lived became Lame and Gouty; another with Quick-Silver died, in about Sixteen Weeks time, Conſumptive, and I diſcovered Quick-Silver in the Impoſtumated parts of his Lungs. *Query*, Whether ſome Perſons that have been Flux'd, or uſed Quick-Silver

Oyntments, and the like, and afterwards become Conſumptive, owe not their Diſtemper to the abuſive uſe of a moſt Excellent Remedy. Much after the ſame manner, the ſubtile Quick-Silver getting into the Maſs of Blood by degrees, through its ponderoſity ſettles in the Lobes of the Lungs, and cauſes Ulcers there. But to return: The Poiſon of Vipers and Mad Dogs I ſuppoſe kill by thickning of the Blood, as many Malignant Fevers alſo do; in all which caſes, I look on Volatil Salts to be the propereſt Phyſick, as keeping the Blood from congealing. I had a ſingular Inſtance hereof in a Gentleman of *Yorkſhire*, bit with a Grey-Hound on the Thurſday, not three Minutes before the Dog died mad; he bit him in ſeveral places of the Hands, as he was giving him a Remedy: The Monday following the Gentleman was very ill, and came to our Town to an Apothecary his Acquaintance, who knowing not what to do, deſired my Aſſiſtance. When I came, the Gentleman could talk, but every two or three Minutes he had violent Fits, and would tell us when they were over, that his Brains worked like Birme in an Ale-Fat, and ſeemed to froth up at every Fit. The Apothecary had no Volatile Salt of Vipers; ſo I took the Volatile Salt of Amber, and ordered him Ten Grains in Treacle-Water every half hour: He told me every Doſe ſeemed to clear his Brain, and cool it as perfectly, as if a Baſon of cold Water were poured on his Head, but it returned by degrees again: Having then a Volatile Salt by me that Vomits very well, I gave him a Doſe thereof; it worked very well, and he was very much better after it: I then ordered him to continue the Volatile Salt of Amber once every four hours, and at each two hours end, that is, betwixt, *Spec. Pleres Archonticon and Rue pouder'd ana gr.* 15. whereby he was ſo well recovered, that within two days he would needs go home, to look after ſome urgent Affairs, and afterwards found himſelf ſo well, that he ſorgot to return, and perfect the courſe; and I heard no more of him for half a Year, when I was fetch'd one Morning to him in great haſt. He had been abroad, play'd the Good-Fellow, and in his return home, having rode a great days Journey, being weary, and I ſuppoſe finding himſelf indiſpoſed, he ſtaid all Night in our Town, it being fortunately in his way. In the Morning when he ſhould have got up, he could not ſtand, whereupon the Apothecary was ſent for, and a Surgeon to Blood him, which was accordingly done, but he grew worſe; for in this caſe I look upon Bleeding to be very prejudicial, as well as in moſt Malignant Fevers, for thereby the Spirits are diminiſhed, and the Blood congealed the ſooner. When they had done all they could, and the Symptoms ſtill increaſed, they at length ſent for me. I never ſaw Man or Creature in that Agony in all my life, that I found him in, ſenſeleſs, and mad, when at beſt, but every Minute the fierceſt ſhiverings ran through him, his Eyes would firſt roll and then ſet, as if ready to ſtart out of his Head, but above all, the Swelling and Luctation at his Breaſt, was as if he would burſt, which went off with a prodigious ſigh: All this I judge the Effects of the Heart labouring to diſcharge itſelf of the ſtagnating Blood, and the Nervous Convulſions as conſequences thereof. And I am the more confirmed in this, from what I ſaw in a Woman that was bit alſo with a Mad-Dog in the Leg, and fell ill the very day that ſhe had paid the Chirurgeon for her Cure; and notwithſtanding all that could be done, growing worſe, they ſent for me; I went, and found her with what is called a *Hydrophobia*: She would look earneſtly after Drink or Water, and ſeem to deſire it, but as ſoon as ſhe began to drink, away it went, be it what it would, with the greateſt violence ſhe could poſſibly fling it. I gave her the Vomit hereafter and alſo before mentioned, but ſhe got but little of it down, and I had no more with me; nevertheleſs it ſo brought her to her ſelf, that ſhe could anſwer Queſtions, and I asked her, whether ſhe was afraid of the Drink and Water, when ſhe flung the Cups in that violent manner from her? She ſaid, No; but when ſhe offered to drink, her Breaſt and Heart would not let her. I asked, whether through any Averſion or Fear? She ſaid, No, ſhe was very Thirſty; but when ſhe offered to drink, it ſtruck to her Heart, and ſtopped her Breath. That is, as I apprehend, the cold Drink paſſing down the Throat ſtruck a chilneſs in the Blood, and made it readier to ſtagnate: beſides the very act of Drinking, hindring the free breathing, conduced alſo much thereto; and therefore the Heart was ſo ſuddenly oppreſs'd, that ſhe could not forbear flinging away whatever ſhe had in her Hand. She complained alſo of a great rigour and ſtiffneſs or ſtraitneſs of the Muſcles of her Breaſt, ſo that poſſibly the Spirituous Liquor that flows in the *Genus Nervoſum* may be congealed as well as the Blood; or the ſame Effects may be ſuppoſed notwithſtanding to be the reſult of the condenſed Blood clogging both the Heart and Lungs, ſo that the Breaſt may ſeem to be ſtraitned therewith. The ſame I judge to be the cauſe of all the violent Luxations in this Gentleman, whoſe Fingers I looked on, and found the places where he had formerly been bit, turned blackiſh, and much inflamed about them, which confirmed me in my ſentiment, that it was a relapſe of his former Diſtemper, that is, of the Bite of the Mad-Dog. I told them, if any thing in the World would ſave his Life, I judged it muſt be the former Vomit of Volatile Salts; they could not tell what to do, nevertheleſs ſuch is the Malignancy of the World, that as ſoon as it was given, they ran away and left me, ſaying, he was now certainly a dead Man, to have a Vomit given in that condition. Nevertheleſs it pleaſed God that he ſhortly after cried, *This Fellow in the Black has done me good*, and after the firſt Vomit, came ſo to himſelf, as to know us all. I vomited him every other day with this Vomit for three times, and made him in the Interim to take Volatile Salt of Amber, and the aforeſaid Pouders, and to waſh his Hands, and Sores in a ſtrong Salt Brine; to drink Poſſet-drink with Sage and Rue, and by this courſe, and the Bleſſing of God, his Life was ſaved, and he perfectly cured, for it is now four Years ſince, and he had had no Relapſe. I have cured ſeveral others by the ſame Method. Coll. *Spencer*, the Secretary of State in *Virginia*, a very Serious and Ingenious Gentleman, told me, that his Servant brought him word once that a Sow having farrow'd, a Rattle-Snake was got into the Den, and had kill'd the Piggs. The Colonel went to ſee the Snake, which they ſaid was ſtill coyl'd in the Den; there followed them two or three Mungrel Curs, and they ſet one of the Dogs at the Snake, which was too quick for the Dog, and ſnapt him by the Noſe, whereupon he ſet a howling, and ran immediately into the adjacent River, and died very ſhortly after. Another of the Dogs upon the like attempt was bit by the Snake alſo, and fell a howling, and froathing, and tumbling; but being he died not ſo ſoon as the other Dog did, they fetch'd ſome of the Herb which they call Dittany, as having a great Traditionary Vertue for the Cure of Poiſons: they pounded it, and adding a little Water, expreſs'd the Juice, and gave the Dog frequently thereof, nevertheleſs he died within a day or two. The howling of the Dogs he ſuppoſed gave notice to the Sow, and made her come furiouſly briſling, and run immediately into her Den; but being likewiſe bit by the Snake, ſhe ſet up a terrible Squeak, and ran alſo into the River, and there dyed.

A Gentlewoman, that was a notable Female Doctreſs, told me, that a Neighbour being bit by a Rattle-Snake, ſwelled exceſſively; ſome days afterwards ſhe was ſent for, who found him ſwell'd beyond what ſhe thought it had been poſſible for the Skin to contain, and very Thirſty. She gave him *Oriental Bezoar* ſhaved, with a ſtrong Decoction of the aforeſaid Dittany, whereby ſhe recovered the Perſon: To the beſt of my Remembrance, it was he that told me, asking him afterwards, what he felt when the Snake firſt bit him? He ſaid, it ſeemed as if a flaſh of Fire had ran through his Veins.

Beſides the Rattle-Snake, there is the Blowing-Snake, an abſolute Species of a Viper, but larger than any that I have ſeen in *Europe*; it is ſo called, becauſe it ſeems to blow, and ſpread its Head, and ſwell very much before it bite, which is very deadly. It is Remarkable there is none of their Snakes there, make any of that hiſſing noiſe that ours in *England* make, but only ſhoot out their Tongues, ſhaking them as ours do, without any noiſe at all; this is a ſhort thick ſort of Snake. There is another ſort of deadly Snake, called the *Red Snake*; I once narrowly eſcaped treading on the back of one of them: They are of an ugly dark brown colour, inclining to red; their bellies are of a more dusky white, with a large ſtreak of Vermilion Red on either ſide; this too is of the Viper kind, but is not ſo ſhort, but its Tail is more taper and ſmall. The *Horn-Snake* is, as they ſay, another ſort of deadly Snake; I never ſaw any of them, unleſs once, ſhortly after my Arrival in that Country, which I cannot atteſt to be the Horn-Snake, for I could not diſtinctly view it, being in a Thicket of *Sumach*, it was perch'd up about two Foot high in a *Sumach* Branch, its Tail twiſted about the Shrub, and about a quarter of a Yard ſtood bolt forward, leaning over the forked Branch thereof: I could not ſee the Horn, which they ſay it has in its front, wherewith it ſtrikes, and if it wounds, is as deadly as the Rattle-Snake's bite. The Gentleman that was with me, told me it was a Horn-Snake; but being in haſt, and on Horſe-back, and the Snake in a Thicket, I could not ſee the Horn; but had I thought I ſhould never have ſeen more of them, I ſhould have took a little pains to have been better ſatisfied. This I think may not improperly be referred to the *Dart-Snakes.*

The *Black Snake*, is the largeſt I think of all others, but I am ſure the moſt common; I have kill'd ſeveral of them full ſix Foot long, their Bite is not deemed Mortal, but it ſwells, and turns to a Running Sore; they feed upon Lizards, Mice, Rats, Frogs, and Toads, which I have taken out of their Bellies. I was once a Simpling in the Woods, on a fair Sun-ſhine day, when I ſaw a Snake crawling on a Tree that was fallen, and licking with its forked Tongue as it moved; I ſtood ſtill to obſerve it, and ſaw it lick up ſmall Inſects and Flies, with wonderful nimbleneſs, catching them betwixt the Forks of its Tongue.

The Corn-Snake, moſt like the Rattle-Snake of all others in colour, but the Checkers are not ſo regular, neither has it any Rattles: They are moſt frequent in the Corn-Fields, and thence I ſuppoſe ſo called; the Bite is not ſo venomous as the Black Snake's.

The *Water-Snake*, a ſmall Snake, I never ſaw any of them above a Yard long, though I have ſometimes ſeen 40 or 50 at once; they are of an ugly dark blackiſh colour: They ſay, they are the leaſt Venomous of any.

Methodus Nova Accurata & facilis inveniendi Radices Æquationum quarumcumque generaliter, ſine prævia Reductione. Per Edm. Halley.

ARtis Analyticæ præcipuus quidem uſus eſt Problemata Mathematica ad æquationes perducere, eaſque terminis quantum fieri poſſit ſimpliciſſimis exhibere. Ars autem iſta manca quodammodo, nec ſatis Analytica merito videretur, niſi Methodi quædam ſubminiſtrarentur, quarum ope Radices, ſive Lineæ ſive Numeri ſint, ex jam inventis æquationibus elicere liceret, eoque nomine Problemata ſoluta dare.

Veteribus ſane vix quicquam ſupra Quadraticarum æquationum naturam innotuit; quæcunque vero ſcripſere de Solidorum Problematum Effectione Geometricâ ope Parabolæ, Ciſſoïdis, aliuſve Curvæ, particularia tantum ſunt, ac caſibus particularibus deſtinata; de Numericâ vero Extractione ubique altum ſilentium; ita ut quicquid in hoc genere jam calculo præſtamus, modernorum inventis fere totum debetur.

Ac primus quidem ingens ille Algebræ hodiernæ repertor ac reſtaurator *Franciſcus Vieta*, annis abhinc circiter centum, Methodum generalem aperuit pro educendis radicibus ex æquatione qualibet; eamque ſub titulo *De Numeroſâ poteſtatum ad Exegeſin Reſolutione* publico donavit, *ubique* ut ait *obſervando retrogradam Compoſitionis viam*. Hujuſque Veſtigiis inſiſtentes *Harriottus*, *Oughtredus* aliique, tam noſtrates tam extranei, quæcunque de hac re ſcriptis mandarunt, à *Vietâ* deſumpta debent agnoſcere. Qualia vero in hoc negotio præſtiterit ſagaciſſima ingenii *Newtoniani* vis, ex contractiore Specimine à Clariſſimo *Walliſio*, Cap. XCIV. Algebræ ſuæ, edito, potius conjecturâ aſſequi quam pro certo comperiri licet. Ac dum obſtinata Authoris modeſtia amicorum precibus devicta cedat, inventaque hæc ſua pulcherrima in lucem promere dignetur, expectare cogimur.

Nuper vero eximius ille juvenis *D. Joſephus Ralphſon, R. S. S. Analyſin Æquationum Univerſalem* Anno 1690. evulgavit, ſuæque Methodi præſtantiam pluribus exemplis abunde illuſtravit; quo Genii Mathematici maxima quæque pollicentis nobile indicium prodidit.

Hujus exemplo ac ductu (ut par eſt credere) *D. de Lagney*, haud vulgaris apud *Pariſienſes* Mathematum Profeſſor, idem argumentum aggreſſus eſt; qui cum totus fere ſit in eliciendis Poteſtatum purarum radicibus, præſertim Cubicâ, pauca tantum eaque perplexa nec ſatis demonſtrata de affectarum radicum extractione ſubjungit. Regulas autem binas compendioſas admodum pro approximatione radicis Cubicæ profert, alteram rationalem, alteram irrationalem; nempe Cubi $aaa + b$ latus eſſe inter $a + \frac{ab}{3aaa + b}$ ac $\sqrt{\frac{1}{4}aa + \frac{b}{3a}} + \frac{1}{2}a$. Radicem autem poteſtatis Quintæ $a^5 + b$ ſic exprimit $= \frac{1}{2}a + \sqrt{\sqrt{\frac{1}{4}a^4 + \frac{b}{5a}} - \frac{1}{4}aa}$ (non $\frac{1}{2}aa$ ut perperam legitur in libro Gallico impreſſo) Has Regulas, cum nondum librum videram, ab amico communicatas habui, quarum vires experimento edoctus, compendiumque admiratus, volui etiam Demonſtrationem inveſtigare: Ea vero inventâ ad Univerſalem Æquationum omnium reſolutionem eandem methodum accommodari poſſe ſtatim cognovi; Eoque magis eas excolere ſtatui, quia uno intuitu rem totam Synoptice explicari poſſe videbam, quodque hoc pacto ſingulis calculi reſtaurati vicibus ſaltem triplicarentur notæ ſive Ciphræ in radice jam inventæ, quæ quidem omnibus aliorum omnium computationibus non niſi pari cum datis numero augentur.

Demonſtrantur autem Regulæ prædictæ ex Geneſi Cubi & Poteſtatis quintæ. Poſito enim Latere Cubi cujuſque $a + e$, Cubus inde conflatus fit $aaa + 3aae + 3aee + eee$, adeoque ſi ſupponatur aaa Numerus Cubus proxime minor dato quovis non Cubo, eee minor erit Unitate, ac reſiduum ſive b æquabitur reliquis Cubi membris $3aae + 3aee + eee$: rejectoque eee ob parvitatem, $b = 3aae + 3aee$. Cumque aae multo majus ſit quam aee, $\frac{b}{3aa}$ non multum excedet ipſam e, poſitoque $e = \frac{b}{3aa}$, $\frac{b}{3aa + 3ae}$, cui proxime æquatur quantitas e, invenietur $= \frac{b}{3aa + \frac{3ab}{3aa}}$ ſive $\frac{b}{3aa + \frac{b}{a}}$: hoc eſt $\frac{ab}{3aaa + b} = e$, adeoque latus Cubi $aaa + b$ habebitur $a + \frac{ab}{3aaa + b}$ quæ eſt ipſa formula rationalis D^{ni} *de Lagney*. Quod ſi aaa fuerit Numerus Cubus proxime major dato, Latus Cubi $aaa - b$ pari ratiocinio invenietur $a - \frac{ab}{3aaa - b}$; atque hæc Radicis Cubicæ approximatio ſatis expedita ac facilis parum admodum fallit in defectu, cum ſcilicet e reſiduum Radicis hoc pacto inventum paulo minus juſto ſit. Irrationalis vero formula etiam ex eodem fonte derivatur, *viz.* $b = 3aae + 3aee$, ſive $\frac{b}{3a} = ae + ee$; adeoque $\sqrt{\tfrac{1}{4}aa + \frac{b}{3a}} = \tfrac{1}{2}a + e$, atque $\sqrt{\tfrac{1}{4}aa + \frac{b}{3a}} + \tfrac{1}{2}a = a + e$ ſive Radici quæſitæ. Latus vero Cubi $aaa - b$ eodem modo habebitur $\tfrac{1}{2}a + \sqrt{\tfrac{1}{4}aa - \frac{b}{3a}}$. Atque hæc quidem formula aliquanto propius ad ſcopum collimat, in exceſſu peccans ſicut altera in defectu, ac ad praxin magis commoda videtur, cum reſtitutio Calculi nihil aliud ſit quam continua additio vel ſubductio ipſius $\frac{eee}{3a}$, ſecundum ac quantitas e innoteſcat; ita ut potius ſcribendum ſit $\sqrt{\frac{1}{4}aa+\frac{b-eee}{3a}}+\frac{1}{2}a$ in priori caſu, ac in poſteriori $\frac{1}{2}a+\sqrt{\frac{1}{4}aa+\frac{eee-b}{3a}}$. Utrâque autem formulâ Ciphræ jam cognitæ in Radice extrahendâ ad minimum triplicantur, quod quidem Arithmeticæ ſtudioſis omnibus gratum fore confido, atque ipſe Inventori abunde gratulor.

Ut autem harum regularum utilitas melius ſentiatur, exemplum unum vel alterum adjungere placuit. Quæratur Latus Cubi dupli, ſive $aaa+b=2$. Hic $a=1$ atque $\frac{b}{3a}=\frac{1}{3}$, adeoque $\frac{1}{2}+\sqrt{\frac{7}{12}}$ ſive 1,26 invenietur Latus prope verum. Cubus autem ex 1,26 eſt 2,000376, adeoque $0{,}63+\sqrt{,3969-\frac{,000376}{3{,}78}}$ ſive $0{,}63+\sqrt{,3968005291005291}=1{,}259921049895-$; quod quidem tredecim figuris Latus Cubi dupli exhibet, nullo fere negotio, *viz.* unâ Diviſione & Lateris Quadrati extractione, ubi vulgari operandi modo quantum deſudaſſet Arithmeticus norunt experti. Hunc etiam calculum quouſque velis continuare licet, augendo quadratum additione $\frac{eee}{3a}$. Quæ quidem correctio hoc in caſu non niſi unitatis in Radicis figurâ decima-quartâ augmentum affert.

Exemp. II. Quæratur Latus Cubi æqualis menſuræ *Anglicæ Gallon* dictæ, uncias ſolidas 231 continentis. Cubus proxime minor eſt 216 cujus Latus $6=a$, ac reſiduum $15=b$ adeoque pro prima approximatione provenit $3+\sqrt{9+\frac{5}{6}}=$ Radici. Cumque $\sqrt{9{,}8333}$... ſit 3,1358... patet $6{,}1358=a+e$. Supponatur jam $6{,}1358=a$,

$$\sqrt[6]{a^6 - b} = \tfrac{4}{5}a + \sqrt{\tfrac{1}{25}aa - \frac{b}{15a^4}} \text{ vel } a - \frac{ab}{6a^6 - \frac{5}{2}b}$$

$$\sqrt[7]{a^7 - b} = \tfrac{5}{6}a + \sqrt{\tfrac{1}{36}aa - \frac{b}{21a^5}} \text{ vel } a - \frac{ab}{7a^7 - 3b}$$

Atque inter hos duos terminos ſemper conſiſtit vera Radix, aliquanto propior irrationali quam rationali; *e* vero juxta formulam irrationalem inventa, ſemper peccat in exceſſu, ſicut in defectu a rationali formulâ reſultans Quotus; adeoque ſi fuerit $+ b$, Irrationalis majorem juſto exhibet radicem, rationalis minorem. E contrario vero ſi fuerit $- b$. Atque hæc de eliciendis radicibus è Poteſtatibus puris dicta ſunto, quæ quidem, ad uſus ordinarios ſufficientes multo facilius habentur ope Logarithmorum: quoties vero ultra Tabularum Logarithmicarum vires accuratiſſime definienda eſt radix, ad hujuſmodi methodos neceſſario recurrendum eſt. Præterea cum ex harum formularum inventione ac contemplatione, Univerſalis Regula pro æquationibus affectis (quam non ſine fructu Geometriæ ac Algebræ ſtudioſis omnibus uſurpandam confido) mihi ipſi oblata ſit, volui ipſius inventi primordia quæ poſſim claritate aperire.

Æquationum quidem affectarum Quadrato-quadratum non excedentium Conſtructionem Generalem concinnam admodum ac facilem, *Num.* 188 harum *Tranſact.* jam tum inventam publici juris feci: ex quo ingens cupido animum inceſſit, idem Numeris efficiendi. At brevi poſt *D^us^ Ralphſon* magna ex parte voto ſatisfeciſſe viſus eſt, uſque dum *D^us^ de Lagney* etiam adhuc compendioſius rem peragi poſſe hoc ſuo libello mihi ſuggeſſit. Methodus autem noſtra hæc eſt.

Supponatur Radix cujuſvis æquationis z compoſita ex partibus $a +$ vel $- e$, quarum a ex hypotheſi aſſumatur ipſi z quantum fieri poſſit propinquam, (quod tamen com-

Tabella Poteſtatum.

$$\begin{array}{lllllllllllllll}
 & & & & s & & t & & u & & w & & x & & y \\
lz^7 & = & la^7 & + & 7la^6e & + & 21la^5ee & + & 35la^4e^3 & + & 35la^3e^4 & + & 21la^2e^5 & + & 7lae^6 + le^7 \\
kz^6 & = & ka^6 & + & 6ka^5e & + & 15ka^4ee & + & 20ka^3e^3 & + & 15ka^2e^4 & + & 6kae^5 & + & ke^6 \\
bz^5 & = & ba^5 & + & 5ba^4e & + & 10ba^3ee & + & 10ba^2e^3 & + & 5bae^4 & + & be^5 & & \\
gz^4 & = & ga^4 & + & 4ga^3e & + & 6ga^2ee & + & 4gae^3 & + & ge^4 & & & & \\
fz^3 & = & fa^3 & + & 3fa^2e & + & 3faee & + & fe^3 & & & & & & \\
dz^2 & = & da^2 & + & 2dae & + & dee & & & & & & & & \\
cz & = & ca & + & ce & & & & & & & & & &
\end{array}$$

Tranſactions, Numb. 210. Pag. 143.

commodum eſt, non neceſſarium) & ex quantitate $a +$ vel $- e$ formentur Poteſtates omnes ipſius z in Æquatione inventas, iiſque affigantur Numeri Coefficientes reſpectivè: deinde Poteſtas Reſolvenda ſubducatur è ſumma partium datarum in primâ columnâ, ubi e non reperitur, quam Homogeneum Comparationis vocant, ſitque differentia $\pm b$. Dein habeatur ſumma omnium coefficientium ipſius lateris e in ſecunda Columna, quæ ſit s; denique in tertia addantur omnes coefficientes quadrati $e\,e$, quarum ſummam vocemus t: Ac radix quæſita z, formulâ rationali habebitur $= a +$ vel $- \dfrac{s\,b}{s\,s + \text{vel} - t\,b}$: Irrationali vero fiet $z = a \mp \dfrac{\frac{1}{2}s \pm \sqrt{\frac{1}{4}s\,s \mp b\,t}}{t}$, id quod exemplis illuſtrare fortaſſe operæ pretium erit. Inſtrumenti vero loco adſit Tabella, Poteſtatum omnium ipſius $a +$ vel $- e$ Geneſin exhibens, quæ ſi opus fuerit continuari facile poſſit. A ſeptimâ vero incipiam, cum pauca Problemata eouſque aſſurgere deprehendantur. Hanc Tabellam jure optimo *Speculum Analyticum Generale* appellare licet. Poteſtates autem prædictæ ex continuâ multiplicatione per $a + e = z$ ortæ, ſic proveniunt, cum ſuis coefficientibus adjunctis, *Vide Tab.*

Quod ſi fuerit $a - e = z$, ex iiſdem membris conficitur Tabella, negatis ſolummodo imparibus Poteſtatibus ipſius e, ut e, e^3, e^5, e^7: & affirmatis paribus e^2, e^4, e^6. Sitque Summa Coefficientium lateris $e = s$; Summa Coefficientium Quadrati $e\,e = t$; Cubi $= u$; Biquadrati $= w$; Surſolidi $e^5 = x$; Summa vero coefficientium Cubocubi $= y$; &c.

Cum autem ſupponatur e exigua tantum pars radicis inquirendæ, omnes poteſtates ipſius e multo minores evadunt ſimilibus ipſius a Poteſtatibus, adeoque pro primâ Hypotheſi rejiciantur ſuperiores, (ut in poteſtatibus puris oſtenſum eſt) ac formatâ æquatione novâ, ſubſtituendo do $a \pm e = z$ habebimus ut diximus $\pm b = \pm se \pm tee$. Cujus rei cape exempla ſequentia, quo melius intelligatur.

Exemp. I. Proponatur æquatio $z^4 - 3zz + 75z = 10000$. Pro prima Hypotheſi ponatur $a = 10$, ac conſequenter prodibit æquatio.

$$\begin{array}{rlllll}
z^4 = & +a^4 & 4a^3e & +6a^2ee & 4ae^3 & +e^4 \\
-dz^2 = & -da^2 & dae & -dee & & \\
+cz = & +ca & ce & & & \\
& & & & & \\
= & +10000 & 4000e & +600ee & 40e^3 & +e^4 \\
& -300 & 60e & -3ee & & \\
& +750 & 75e & & & \\
& -10000 & & & & \\
\hline
& +450 & -\underset{s}{4015}e & +\underset{t}{597}ee & -\underset{u}{40}e^3 & +e^4 = 0
\end{array}$$

Signis + ac — (reſpectu e ac e^3) in dubio relictis, uſque dum ſciatur an e ſit negativa vel affirmativa; Quod quidem aliquam paret difficultatem, cum in æquationibus plures radices admittentibus, ſæpe augeantur Homogenia Comparationis, ut appellant, à minuta quantitate a, ac è contra eâ auctâ minuantur. Determinatur autem ſignum ipſius e ex ſigno quantitatis b; ſublatâ enim Reſolvendâ ex Homogenio ab a formato, ſignum ipſius se, ac proinde partium in ejus compoſitione prævalentium, ſemper contrarium erit ſigno differentiæ b. Unde patebit an fuerit $-e$ vel $+e$, ſive an a major vel minor radice vera aſſumpta ſit. Ipſa autem e ſemper æquatur $\frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$, quoties b ac t eodem ſigno notantur; quoties vero diverſo ſigno connectuntur, eadem e fit $\frac{\sqrt{\frac{1}{4}ss + bt} - \frac{1}{2}s}{t}$. Poſtquam vero compertum ſit fore $-e$, in affirmatis æquationis membris negentur e, e^3, e^5, &c. in negatis affirmentur; ſcribantur ſcilicet ſigno contrario; ſi vero fuerit $+e$, affirmentur in affirmatis,

matis, negentur in negatis. Habemus autem in hoc noſtro exemplo 10450 loco Reſolvendæ 10000, ſive $b = + 450$, unde conſtat a majorem juſto aſſumptam, ac proinde haberi $-e$: Hinc æquatio fit $10450 - 4015e + 597ee - 4e^3 + e^4 = 10000$. Hoc eſt $450 - 4015e + 597ee = 0$. Adeoque $450 = 4015e - 597ee$ ſive $b = se - tee$ cujus Radix e fit $\frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$. Vel ſi mavis $\frac{s}{2t} - \sqrt{\frac{ss}{4tt} - \frac{b}{t}}$, id eſt, in præſenti caſu, $e = \frac{2007\frac{1}{2} - \sqrt{3761406\frac{1}{4}}}{597}$, unde provenit Radix quæſita prope verum, 9,886. Hoc vero pro ſecundâ Hypotheſi ſubſtituto, emergit $a + e = z$ accuratiſſime 9,886260393 6495...., in ultima figura vix binario juſtum ſuperans; nempe cum $\frac{\sqrt{\frac{1}{4}ss + bt} - \frac{1}{2}s}{t} = e$. Atque hoc etiam ſi opus fuerit, multo ulterius verificari poſſit, ſubducendo $\frac{\frac{1}{2}ue^3 + \frac{1}{2}e^4}{\sqrt{\frac{1}{4}ss + tb}}$ ſi fuerit $+e$, vel addendo $\frac{\frac{1}{2}ue^3 - \frac{1}{2}e^4}{\sqrt{\frac{1}{4}ss - tb}}$, radici prius inventæ, ſi ſit $-e$. Cujus compendium eo pluris æſtimandum quod quandoque, ex ſola prima ſuppoſitione, ſemper vero ex ſecunda, iiſdem conſervatis coefficientibus quouſque velis calculum continuare poſſis. Cæterum æquatio prædicta etiam negativam habet radicem, *viz.* $z = 10,26.....$ quam cuilibet accuratius expiſcari licet.

Exemp. II. Sit $z^3 - 17zz + 54z = 350$ ac ponatur $a = 10$. Ex præſcripto Regulæ,

$$\begin{aligned} zzz &= aaa + 3aae + 3aee + eee \\ -dzz &= daa - 2dae - d\,ee \\ +c\,z &= c\,a + c\,e \end{aligned}$$

$$\begin{array}{lllll} & b & s & t & \\ \text{Id eſt} & +1000 & +300e & +30ee & +eee \\ & -1700 & -340e & -17ee & \\ & +540 & +54e & & \\ & -350 & & & \\ \hline \text{Sive} & -510 & +14e & +13ee & +eee=0 \end{array}$$

Cum autem habeatur -510, conſtat a minorem juſto aſſumi, ac proinde e affirmativam eſſe, ac ex $510=14e+$ $+13ee$ fit $\frac{\sqrt{bt+\frac{1}{4}ss}-\frac{1}{2}s}{t}=e=\frac{\sqrt{6679}-7}{13}$, unde z fit $15,7\ldots$ quæ nimia quidem eſt ob late ſumptam a; ideo ſupponatur ſecundo $a=15$, ac pari ratiocinio habebimus $e=\frac{\frac{1}{2}s-\sqrt{\frac{1}{4}ss-tb}}{t}=\frac{109\frac{1}{2}-\sqrt{11710\frac{1}{4}}}{28}$ ac proinde $z=14,954068$. Quod ſi calculum adhuc tertio reſtaurare velis, uſque in vigeſimam quintam figuram vero conformem invenies radicem: Paucioribus vero contentus, ſcribendo $tb\pm teee$ loco tb, vel ſubtrahendo aut addendo radici prius inventæ $\frac{\frac{1}{2}eee}{\sqrt{\frac{1}{4}ss\mp tb}}$ ad ſcopum ſtatim perveniet. Æquatio vero propoſita nulla alia radice explicari poteſt, quia Poteſtas Reſolvenda 350 major eſt Cubo ex $\frac{17}{3}$ vel $\frac{1}{3}d$.

Exemp. III. Sit Æquatio illa quam in Reſolutione difficillimi Problematis Arithmetici adhibet Clariſſimus *Walliſius*, Cap. LXII. Algebræ ſuæ, quo radicem *Vietæ* Methodo accuratiſſime quidem aſſecutus eſt: Eandemque exemplum Methodi ſuæ affert laudatus *D^s Ralphſon*, *pag.* 25, 26. nempe $z^4-80z^3+1998z^2-14937z+$ $+5000=0$. Hæc autem æquatio ejus formulæ eſt, ut plures habeat radices Affirmativas, ac quod difficultatem ejus augeat, prægrandes ſunt Coefficientes reſpectu Reſolvendæ datæ: Quo melius autem tractetur, dividatur, ac juxta notas punctationum regulas ponatur $-z^4+8z^3-20z^2+15z=0,5$ (ubi z eſt $\frac{1}{10}z$ in æquatione propoſita) ac pro prima Hypotheſi habeamus $a=1$. Proinde.

+2

$$+2 - 5e - 2ee + 4e^3 - e^4 - 0{,}5 = 0$$

Hoc eſt $1\frac{1}{2} = 5e + 2ee$; hinc $\frac{\sqrt{\frac{1}{4}ss + bt} - \frac{1}{2}s}{t} = e$ fit $\frac{\sqrt{37} - 5}{4}$ adeoque $z = 1{,}27$: Unde conſtat $12{,}7$ radicem eſſe æquationis propoſitæ vero vicinam. Secundo loco ſupponatur $z = 12{,}7$ ac juxta præſcriptum Tabellæ Poteſtatum oritur.

$$\begin{array}{llll}
b & s & t & u \\
-26014{,}4641 & -8193{,}532\,e & -967{,}74\,ee & -50{,}8\,e^3 - e^4 \\
+163870{,}640 & +38709{,}60\,e & +3048\,ee & +80\,e^3 \\
-322257{,}42 & -50749{,}2\,e & -1998\,ee & \\
+189699{,}9 & +14937\,e & & \\
-5000 & & & \\
\hline
+298{,}6559 & -5296{,}132\,e & +82{,}26\,ee & +29{,}2\,e^3 - e^4 = 0
\end{array}$$

Adeoque $-298{,}6559 = -5296{,}132\,e + 82{,}26\,ee$, cujus radix e juxta regulam $= \frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt}}{t}$ fit $\frac{2648{,}066 - \sqrt{6987686{,}106022}}{82{,}26} = {,}0564408033\,1\ldots = e$ minori vero: Ut autem corrigatur, $\frac{\frac{1}{2}ue^3 - \frac{1}{2}e^4}{\sqrt{\frac{1}{4}ss - bt}}$ ſive $\frac{{,}0026201\ldots}{2643{,}423\ldots}$ fit ${,}00000099117$, ac proinde e correcta $= 05644179448$; Quod ſi adhuc plures radicis figuras deſideras, formetur ex e correctâ $tue^3 - te^4 = 0{,}43105602423\ldots$, ac $\frac{\frac{1}{2}s - \sqrt{\frac{1}{4}ss - bt - tue^3 + te^4}}{t}$ ſive $\frac{2648{,}066 - \sqrt{6987685{,}67496597577\ldots}}{82{,}26} = {,}05644179448074402 = e$, unde $a + e = z$ radix accuratiſſima fit $12{,}75644179448074402\ldots$ qualem invenit Cl. *Walliſius* in loco citato. Ubi obſervandum redintegrationem calculi ſemper triplicare notas veras in aſſumpta a, quas prima correctio ſive $\frac{\frac{1}{2}ue^3 - \frac{1}{2}e^4}{\sqrt{\frac{1}{4}ss - bt}}$ quintuplices reddit, quæque etiam commode per Logarithmos efficitur. Altera autem correctio poſt primam, etiam duplum Cipharum

numerum

numerum adjungit, ut omnino aſſumptas ſeptuplicet; prima tamen plerumque uſibus Arithmetices abunde ſufficit. Quæ vero dicta ſunt de numero cipharum in radice recte aſſumptarum, ita intelligi velim, ut cum a non niſi decimâ parte diſtet à vera radice, prima figura recte aſſumatur; ſi intra centeſimam partem, duæ primæ: Si intra milleſimam tres priores rite ſe habeant; quæ deinde juxta noſtram regulam tractatæ ſtatim novem evadunt.

Reſtat jam ut nonnulla adjiciam de noſtra formula rationali, *viz.* $e = \frac{sb}{ss \pm tb}$, quæ quidem ſatis expedita videbitur, nec multum cedit priori, cum etiam datas ciphras triplicare valeat. Formata autem æquatione ex $a \pm e = z$, ut prius, ſtatim patebit an a aſſumpta ſit major vel minor vero, cum ſcilicet se ſigno ſemper notari debeat contrario ſigno differentiæ Reſolvendæ ac Homogenii ſui ex a producti. Deinde poſito quod $\pm b \mp se$ $+$ vel $-$ $tee = 0$; diviſor fit $ss - tb$ quoties b ac t iiſdem ſignis notantur; idem vero fit $ss + bt$, ſi ſigna iſta diverſa ſint. Praxi autem magis accommodata videtur, ſi ſcriberetur Theorema, $e = \frac{b}{s \pm \frac{tb}{s}}$ nempe cum unâ multiplicatione ac duabus diviſionibus res peragatur, quæ tres multiplicationes ac unam diviſionem alias requireret. Hujus etiam Methodi exemplum capiamus à prædictæ Æquationis radice 12,7...: ubi

$$\underset{+b}{298{,}6559} \underset{-s}{-\,5296{,}132}e \underset{+t}{+\,82{,}26}ee \underset{+u}{+\,29{,}2}e^3 - e^4 = 0,$$

adeoque $\frac{b}{s - \frac{tb}{s}} = e$, hoc eſt, fiat ut s ad t ita b ad $\frac{tb}{s}$ $= 5296.132)298{,}6559$ in $82{,}26(4{,}63875\ldots$ quocirca diviſor fit $s - \frac{tb}{s} = 5291{,}49325\ldots)298{,}6559(0{,}056441\ldots = e$, *viz.* quinque figuris veris adjectis radici aſſumptæ. Corrigi autem nequit hæc formula ſicut præcedens irrationalis; adeoque ſi plures deſiderentur radicis figuræ, præſtat aſſumpta nova Hypotheſi calculum de integro repetere: ac novus Quotus triplicando figuras in radice cognitas ſupputatori etiam maxime ſcrupuloſo abunde ſatisfaciet.

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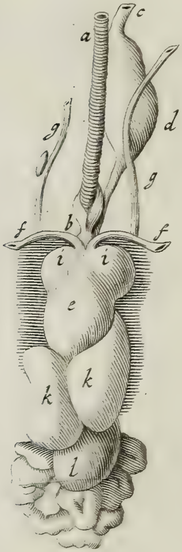
[illegible]

Philosophical Transactions N.º 211.

Fig: I.



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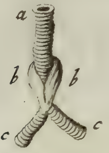

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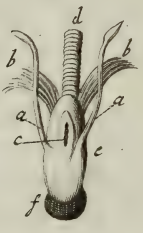

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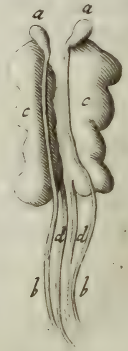

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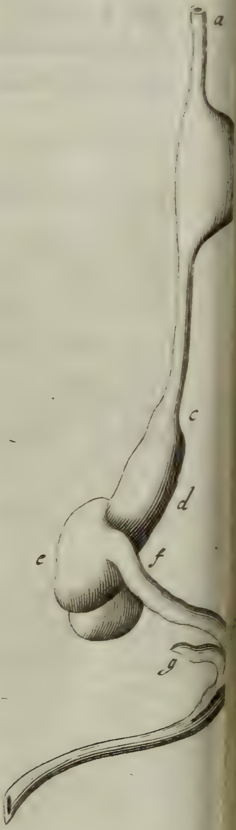


Fig: VI.

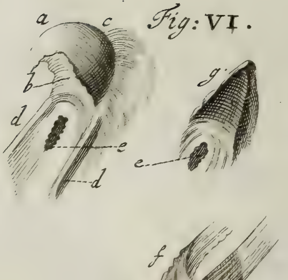
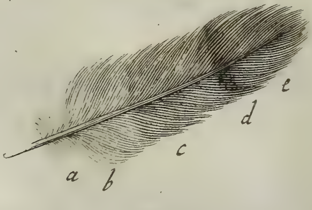


Fig: VII.



PHILOSOPHICAL TRANSACTIONS.

For the Month of June, 1694.

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I. *An Epiſtle writ by* Joſephus de Aromatariis, *concerning the* Seeds of Plants, *and* Generation of Animals.

SIR,

LAtely meeting with an Epiſtle written by *Joſephus de Aromatariis*, containing ſeveral Obſervables touching the *Generation of Plants and Animals*, which I expected not to have found ſo early in the World, I thought it not amiſs if it were inſerted in theſe Tracts, in regard, though already Printed, yet it is a great while ſince, and the Book ſcarce. It was Publiſh'd amongſt ſome few other Treatiſes of the ſame Author at *Frankfort*, and Dedicated to the Lady *Alethea*, Counteſs of *Arundel* and *Surrey*, in the Year 1625. The Epiſtle follows:

Epiſtola de Generatione Plantarum ex ſeminibus. *Præſtantiſſimo Oratori,* Bartholomæo Nanti *Philoſ. & J. V. D.* Joſephus de Aromatariis *Favorini F. S. P. D.*

Eruditiſſime *Nanti,* Libros de Generatione, quos multis abhinc annis moliebar, non conſcripſi, nimium diſtractus ob fluentem numerum ægrotantium Nobilium, curæ meæ commiſſorum; & ob nimiam corpuſculi mei imbecillitatem, quæ longas Vigilias & Labores renuit. Adnotabo nihilominus breviſſimè per capita quædam potiora attinentia ad Plantarum ſemina; ut niſi ſatisfaciam, paream ſaltem tibi, & erunt ea ipſiſſima, quæ ſæpius ore alias explicavi. Addam & ea duo, quæ de Ovis quæſiviſti. Poterunt forſan quæ narrabo, nimium prorſus nova videri multis, & ab humano conceptu aliena nimium: Verum non quidem tibi, qui non ſolum aliàs benignè audiviſti; ſed optimè noſti, hominum ingenia rebus accommodanda eſſe, non quidem contra; & antiquiſſima extare quæcunque ſemper eodem prorſus modo Natura præſtitit, cognoverintnè homines vel non. Conſcribam aliàs jam conceptos de Generatione Libros, in quibus multa forſitan ultra communem opinionem enarrabo, non diſcrepantia (ut credo) à rei Natura. Nec forſitan longum valde Tempus ab hac Epiſtola diſtabunt. Hoc interim ſat erit hæc pauca ſignare: *Plantarum vocata ſemina non eſſe ſemina: Et non habere vim, actu*

(*ut dicunt*) *vel potentia generandi Plantam.* Sed cum poſſint hæc obſcura nimium exiſtimari multis, aperiam rem clariùs.

1. *Plantæ determinatis temporibus prolificum ſemen generant; animalium ſeminibus proportione reſpondens; ex Materiâ quadam ſpiritibus commixtâ.*

2. *Illud autem excernunt in vocatis ſeminibus; veluti in parvis uteris, vel (ſi cum* Empedocle *loquaris) in ovis arborum.*

3. *Iis locis ſpiritus incluſus ſubditam Materiam fortiùs aggreditur, & novo ſemper affluente ſpiritu vivifico domat adeo, ut ex ejus potiori parte parviſſimam Plantam revera generet, determinatis organis diſtinctam & conformatam, & verâ vivificet Plantali Vitâ: Reliquam vero partem releget in alimentum aſſumendum ab ipſa Effigiata & formata Planta,* &c.

4. *Parva quæ gignitur Planta in cognominatis ſeminibus, vel gignitur qua parte Pediculus adhæret: vel prorſus contra: vel alio quodam modo.*

5 *Quæ gignitur qua parte pediculus adhæret, exporrigit ad Pediculum Radices, folia autem ad Apicem.*

6. *Quæ vero gignitur in Apice, folia extendit pediculum verſus; radices autem ad Apicem.*

7. *Nec de ſunt alii modi.*

8. *Parva hæc Planta, ex quo die gignitur, vivit, nutritur, augetur: Et determinato tempore decreſcit, non aliter ac animal ſenectute laborans: Ac tandem moritur, niſi determinato loco & tempore ſeratur.*

9. *Plurima harum Plantarum, quouſque extant in vocatis ſeminibus latentes, nutriuntur per adnatas quaſdam (ut ita dicam) umbilicales vias.*

10. *Unde Plantarum vocata ſemina, quæcunque jam genitam & conformatam Plantam obtinent, ſunt fœcunda.*

11. *Quæ vero non habent, infœcunda prorſus extant: Nec ullo amplius remedio fœcundari poſſunt, ſi deciderint à Planta.*

12. *A vocatis igitur ſeminibus debito loco ſatis, naſcitur Planta, non gignitur.*

13. *Generatio fit ope vocatæ concoctionis.*

14. *Ortus fit cum recrudatione Plantæ & concoctione aſſumpti nutrimenti.*

15. *Pro Plantarum ortu, vocata ſemina lac generant, ut ita dicam; ex ea parte quæ ad nutriendum deſtinata fuerat, & congeneo attracto humore: ad faciliorem inde nutritionem & auctionem.*

16. *Orta Planta non amplius à vocato ſemine recipit præparatum alimentum, niſi parum: ſed à terra aliove proportionato loco.*

17. *Nec amplius per adnatas vias, niſi ut diximus parum: ſed per radicem ſugit; non aliter ac animal, quod primo per Umbilicales Venas creditur nutrimentum capere, exortum vero per Os aſſumit.*

Hæc ſunt pauca veluti ſemina dicendorum in *Lib. de Generatione*, quatenus ad Plantas ex ſeminibus ortas attinet. Ex quibus facillime colligitur (ſi vera ſunt ut credimus) quam vanæ agitentur quæſtiones quotidiè dum quæritur. *Quomodo vocata ſemina ab arbore aliiſve Plantis jam excerpta, debito loco ſata novam Plantam generent. Anque adſit in ipſis forma Plantæ necne?* Aſſerentibus nonnullis formam ibi eſſe in potentia tantum: nonnullis vero affirmantibus, non adhuc extante organizatione, vere adeſſe formam, ut dicunt, actu; quæ ſibi ipſi domicilium paret. Non aliter ac ſi forma Plantarum eſſet quid verè ſeparatum, ut dicunt, exiſtentia, utens materia tanquam lignis ad navem fabricandam; eſſetque forma exiſtens realiter, rei tamen non formatæ; magis quam Nauta non Navigii Nauta. Nec non aliæ inextricabiles petitiones, excitatæ ad humanum ingenium labefactandum, & è recta Philoſophandi via deturbandum. Quod autem attinet ad *Ova Gallinarum*; exiſtimamus equidem, *Pullum in Ovo delineatum eſſe, antequam foveatur à Gallina. Et credimus augeri à calido materno, non ſolum tanquam à fovente, verum partim etiam tanquam à materia nutriente; quod & aliis quibuſdam animantibus ab aëre commune contingere putamus; veluti in lib. de generatione animalium Deo dante enarrabimus.* Vale, meque ut ſoles ama.

III. *Obſerva-*

III. *Obſervations in the Diſſection of a Paroquet, made and Communicated to the* Royal Society *by Mr.* Rich. Waller.

THERE is not poſſibly a greater variety of Species than in the Parrot-kind, whether we conſider the Country, ſize, or colour; in which laſt particular no Bird prides in ſo great a diverſity, luxuriant Nature painting him with all the ſilken colours of Plants and Flowers, and that in their greateſt Luſtre and Perfection. *Johnſton* treating of theſe Birds, ſays, the Curious have obſerved above an Hundred ſorts of them: And *Margravius*, in his Hiſtory of *Brazile*, enumerates ſeveral, his ſixth Species of Paroquets, which he calls *Tajete*, coming very near our Subject. But the true Deſcription as I take it of this Bird is given by *Johnſton* in his *Mantiſſa* to the Hiſtory of Birds, *Cap.* 4. *pag.* 156. which being long, I forbear to recite; the Bird, he ſays, was brought by the *Dutch* Seamen out of *Æthiopia*, and Places near *Manicongo*.

Having kept ſome of theſe Birds, and one of them dying, in the opening thereof I took notice of ſome few Particulars, which I here make bold to preſent this Honourable Aſſembly with.

1. Firſt, To give a ſhort Deſcription thereof. Its ſize is between a Sparrow and a Black-bird, with a ſhort Neck, black Eyes, a crooked Scarlet Bill, greyiſh Legs nd Feet, with Toes, two before, and two behind, like he Parrot; yet he never ſtands on one Foot to eat with he other, as Parrots do. When he ſtands ſtill on the Perch his Breaſt and Belly ſhew of a curious light green, is Back, and the Feathers of his Wings are ſomewhat arker; on his Pinions are ſome ſhort blew Feathers,

as likewiſe a pretty many on his Rump. His Bill is encompaſſed up to the Eyes with a broad beautiful Scarlet Circle, reaching alſo down to his Throat: This place in the Hen is of a paler Orange colour, wherein is the only obſervable difference. The Feathers of the Tail (which as in all ſmall Paroquets is no longer than the Wings) are not to be ſeen but when he flutters or ſpreads it. They are about two Inches long, near the Quill of a Lemon-colour enclining to a green; next that a Scarlet for a pretty breadth, then a narrow Thread of green on ſome of them; after that a black, and laſt of all ending in a light green. It were not an unworthy Curioſity to examine the colours of the Feathers of Birds, and how the ſame individual branch of the ſtem of a Feather, as here, comes to be tinged with ſuch diverſity of Colours; but that by the by.

2. Having opened the *Thorax* and *Abdomen* (if I may ſo call them) by blowing into the *Aſpera Arteria*, a large Cavity or Bladder was raiſed up all along the *Abdomen* to the edges of the *Os Iſchion*, and faſtened to the Gizzard, containing in it all the Guts and Gizzard, but excluding the Heart and Liver. A conformation like this is obſerved in all Birds, and peculiar to them, and mentioned by *Perault* in his *Mechanique des Animaux*. The Air received by the Lungs refreſhing and carrying off the noxious ſteams from the Entrails, and is not confined, as in Men and Quadrupedes, to the *Thorax* only, by a *Mediaſtinum*. Why this is ſo in Birds may be farther enquired.

3. The *Aſpera Arteria* differs from that of moſt other Animals, having not only a *Larynx* at the top thereof, as is uſual, but another alſo at its entrance into the Breaſt, where it is divided, and branches it ſelf into two. From this Structure, as I have been told, common to all Parrots, poſſibly it may be that they can ſo readily imitate Humane Voices; but this Creature we diſſected

never attempts an imitation of words, making only a ſhrill chirping Noiſe, doubling the Tone, or making it eight Notes lower, as a ſtopt Organ-Pipe is an Eighth to the ſame open. This lower *Larynx* may aſſiſt the weak Fabrick of ſo ſmall a Creature as a Parrot to counterfeit ſo Baſſe a Voice as a Man's; it being obſerved by ſome Ingenious Perſons, that Parrots are *Ventriloqui*, and whether all Ventriloquous Cheſts may not by Nature be framed for ſuch an Impoſture, may be Queried, if the Bodies of any ſuch ſhould be diſſected.

4. The *Heart*, in proportion to the Animal, was large, and Liver ſmall, as may be ſeen by the Figure. There was nothing that I obſerved extraordinary in the Teſticles or Kidneys, however I have given a Figure thereof.

5. The *Tongue* was broad and thick, at the end ſomewhat like a Man's, whence a Parrot has its Name ἀνθρωπόγλωττος, the extremity of it was armed with a black horny cover.

6. Having done with thoſe Parts that relate to the Air and Blood, to proceed to thoſe that concern the Reception and Digeſtion of the Food: It has beſides the Gizzard two Craws; the uppermoſt Craw being only a Receptacle or Sack for the Food (which is Canary Seed) to be again committed to the Mouth of this Bird, where it is again chewed, having before been only husked; this Animal ruminating as ſome Quadrupedes do, and I have obſerved this Bird when upon the Perch not only bring its Food again up into its Mouth, and there chew it, but when the Cock and Hen ſit together on the Perch, he will put it out of his into the Hen's Mouth. Their manner of chewing is thus: The under Bill being much ſhorter, ſhuts within the upper, or againſt the Roof of the Mouth, which is fitted with ſeveral rows of very ſmall and ſcarce to be ſeen croſs-bars, as the Mouths of Horſes, Dogs, and ſome other Animals are: Theſe Bars

are not ſoft, but horny, as being part of the upper Bill, ſo that the Bird by carrying the edge of the under Bill and end of the Tongue againſt the ridges in the upper, breaks and reduces to a Pap the Seeds that have been firſt moiſtened in the Craw; to expedite which action the upper Bill is joynted juſt below the Eyes of this Bird, as the *Crocodile*'s upper Jaw has erroneouſly thought to have been, but is really ſo here. The Food being thus macerated, is by the *Gula* again committed to the ſecond Craw, but before its entrance into it, it paſſes by an abundance of ſmall Glands placed in that part of the *Gula*, that the Food may ſqueeze out of them in its paſſage a Juice, of what neceſſity in Digeſtion may be enquired. From hence the Food paſſes to the Gizzard, or proper Ventricle, ſmall in compariſon of the *Ingluvies* or Crop; where by ſeveral ſmall Stones pickt out of the Sand given it, by the motion of the Gizzard it is comminuted, and thence tranſmitted to the Inteſtines, on the ſides of which within a ſmall diſtance is placed the *Pancreas.* The proportions of all theſe Parts to each other will be beſt ſeen by the Figures, which were purpoſely deſigned as big as the Life.

The Explication of the Figures.

Fig. I.

a. *The* Aſpera Arteria.
b. *That part which forms as it were another* Larynx.
c. *Part of the* Gula.
d. *The upper Craw.*
e. *The Heart.*
f. f. *The* Venæ axiliares.
g. g. *The Jugulars.*
h. *A ſmall Gland on one of them.*
i. i. *The two Auricles of the Heart.*
k. k. *The Liver.*
l. *The Gizzard.*

Fig. II.

a. *The* Trachea.

b. b. *The* Larynx, *by which Parrots are rendred* Ventriloqui.
c. c. *The two branches of the* Trachea.

Fig. III.

a. a. *The* Cornua *of the* Os Hyoides.
b. b. *Two Muſcles of the* Larynx.
c. *The Fiſſure or* Glottis.
d. *The* Trachea.
e. *The Tongue.*
f. *The horny end thereof.*

Fig. IV.

a. a. *The* Teſtes.
b. b. *The* Deferentia.
c. c. *The Kidneys.*
d. d. *The Vreters.*

Fig. V.

a. *The upper part of the* Gula.
b. *The firſt or upper Craw.*
c. *That part of the* Gula, *whoſe inſide is Glandulous.*
d. *The lower Craw.*
e. *The Gizzard or Ventricle.*
f. *The firſt Inteſtine.*
g. g. *The* Pancreas.

Fig. VI.

a. *The upper Bill.*
b. *The inſide of it.*
d. d. *The upper Jaw.*
c. *The place where the upper Bill is moveable.*
e. *A paſſage to the Noſtrils*
f. *The lower Bill.*
g. *The upper Bill in a another poſture, to ſhew the ſmall ridges therein.*

Fig. VII.

One of the Feathers of the Tail.

a. *That part furniſht only with a white Down.*
b. *The part that is yellow.*
c. *The Scarlet Part.*
d. *Where it is black.*
e. *The Green Part.*

IV.

IV. *An Abſtract of a Letter from Mr.* Samuel Dale, *to Dr.* William Briggs, *M. D. F. R. S. Concerning a Contumacious* Jaundiſe, *accompanied with a very odd caſe in* Viſion.

Braintree, *Oct.* the *27th.* 1693.

S I R,

THAT you might not think me unmindful of my promiſe to you when you were at *Braintree*; I have here ſent you the Account of my Patient *Grace Dennis*, of *Braxſted Magna*, in this County of *Eſſex*, which you did deſire of me.

About *Chriſtmas*, *Anno* 1689. After much grief and trouble of Mind in the foregoing Autumn, the Jaundiſe began to appear upon her; for which, after having for about nine Months uſed many Medicines, which were told her by divers of her Friends and Acquaintance, but withnout Succeſs: She in *September*, 1690. applyed her ſelf to me, to whom I adminiſtred divers Medicines, famous in the moſt Celebrated Authors for the cure of the *Jaundiſe*, and which I had often uſed with Succeſs in the cure of that Diſeaſe, yet to her they were of no Benefit: After which ſhe had the Advice of ſeveral Learned Phyſicians in the Countrey, and likewiſe of ſome in *London*; but all that could be done for her hath not yet had any Effect, for her Diſeaſe yet continues; and her Body which uſed to be plump and fleſhy, is now become lean and emaciated, almoſt like a Skeleton, and her Appetite is little and depraved.

In *May* 1691. after an extraordinary *Menſtrual Flux* for about three Months, ſhe began as ſoon as the Sun was down, to be deprived of her Sight by degrees until it was quite dark; when altho never ſo big a fire or many candles were in the Room, yet could ſhe not diſcern the Object (except a ſmall ſhining of Light) and ſo ſhe remained until the Morning as one Stone Blind, when by little and little, as the light encreaſed her ſight returned, until the *Sun* aroſe, and then ſhe recovered her perfect ſight.

And in this Caſe ſhe continued, until *Auguſt* 1692. when being returned from *Epſom*, where ſhe had been drinking the Waters for about a Month, her ſight returned to her again, ſo that ſhe could ſee in the Night perfectly. Thus ſhe continued until *January* laſt, when an extraordinary *Menſtrual Flux* again ſeizing her, her Nocturnal ſight likewiſe left her, and ſhe became Blind again as formerly.

Laſt *July* ſhe was ſeized with a *Fever*, when her ſight again returned and continued for about a Month and then left her as formerly; ſo that now ſhe hath her Nocturnal Blindneſs, and her *Jaundiſe* likewiſe continues.

Thus Sir, I have hereby troubled you with an exact Relation from time to time of matter of fact, and will leave the *Philoſophical Solution* thereof, to be decided by the better Judgments of your ſelf and others, in the mean time ſubſcribe my ſelf,

Sir, Yours, &c.

V. *Librorum Manuſcriptorum Academiarum* Oxonienſis & Cantabrigienſis, & *Celebrium per* Angliam Hiberniamque *Bibliothecarum Catalogus cum Indice Alphabetico, Cura* Edvardi Bernardi. *Tomis duobus in Folio.*

TOMI PRIMI PARS PRIMA.

Catalogi Librorum Manuſcriptorum Bibliothecæ BODLEIANÆ.

1. Codices Græci Baroc-ciani.
2. Codices Græci Thomæ Roe Militis.
3. Codices Græci Olivarii Cromwelli.
4. Codices varii Guil. Laudi Archiepiſcopi Cantuarienſis.
5. Codices Latini Kenelmi Digbæi Militis.
6. Codices plurium generum Thomæ Bodlei Militis.
7. Codices varii Joannis Seldeni J. C.
8. Codices varii D. Fairfax Bar. Cameronii, Caroli Hattoni, Mer. Caſauboni, Roberti Huntingtoni, Ricardi Jameſii, Doctoris Lamb, Samuelis Clerici, D. Thurſtoni Mercatoris, Rogeri Dodſworthi, Joannis Lelandi.
9. Codices Septentrionales Franciſci Junii, Reliquiæ Iſaaci Caſauboni, Adverſaria Gerardi Langbaini.
10. Codices varii Thomæ Mareſchalli.
11. Codices Orientales Edvardi Pocockii.
12. Codices Orientales Rob. Huntingtoni.
13. Codices Orientales Thomæ Hyde.
14. Codices Thomæ Barlow Epiſcopi Lincolnienſis.

* Codices Guil. Dugdalii Militis.
* Codices Mathematici Henrici Savilii Militis.
* Codices Eliæ Aſhmolii.

PARS SECUNDA.

Codices Manuſcripti Collegiorum & Aularum *OXONIENSIUM.*

PARS TERTIA.

Codices Manuſcripti Collegiorum & Aularum *CANTABRIGIENSIUM.*

TOMUS SECUNDUS.

Codices Manuſcripti Eccleſiarum Cathedralium & aliarum celebrium Bibliothecarum.

1. Eccleſiæ Eboracenſis.
2. Eccleſiæ Dunelmenſis.
3. Eccleſiæ Carliolenſis.
4. Illuſtriſſ. D. Caroli Comitis Carliolenſis.

5. Eccleſiæ Wignorienſis.
6. Sariſburienſis Eccleſiæ.
7. Weſtmonaſterienſis Eccleſiæ.
8. Lichfieldenſis Eccleſiæ.
9. Scholæ Coventrienſis.
10. Illuſtriſſ. D. Baſil. Comitis Denbigh.
11. Eccleſiæ Cathedralis Wintoniæ.
12. Collegii apud Wintoniam.
13. Illuſtriſſ. D. Hen. Comitis Clarendon.
14. Henrici Jones Rect. de Sunningwell.
15. Collegii Etonenſis.
16. Rogeri Moſtyn Baronetti.
17. Civitatis Briſtolienſis.
18. Eccleſiæ Cantuarienſis.
19. Eccleſiæ Herefordenſis.
20. Eccleſiæ Exonienſis.
21. Scholæ Novò-Portenſis.
22. Scholæ Salopienſis.
23. Gulielmi Glynne Baronetti.
24. Henrici Worſley Armigeri.
25. D. Theyre Generoſi.
26. Hoſpitii Grayenſis apud Londinum.
27. Hoſpitii Lincolnienſis ibidem.
28. Eccleſiæ Gloceſtrienſis.
29. Scholæ Leiceſtrienſis.
30. Roberti Daſhwood Baronetti.
31. Johannis Walteri Baronetti.
32. Domini Oaſtly.
33. Thomæ Gale Theol. Doctoris.
34. Samuelis Pepys Armigeri.
35. Collegii Sionenſis apud Londinium.
36. Collegii Medicorum Londinienſium.
37. Collegii Heraldorum.
38. Bibliothecæ Norfolcianæ Reg. Soc.
39. Eccleſiæ Colliegiatæ apud Warwicum.
40. Eccleſiæ Bathonienſis.
41. Eccleſiæ Wellenſis.
42. Iſaaci Voſſii Canonici Windſorienſis.
43. Georgii Wheeleri Eq. Aur.
44. Johannis Aubræi Baron.
45. D. Thomæ Wagſtaffe.
46. Honoratiſſimi Vicecomitis Longueville.
47. Roberti Plott LL. D.
48. Eccleſiæ Cantuarienſis.
49. Jacobi Uſſerii Archiep. Armachani.
50. Narciſſi Marſh Archiep. Dublinienſis.
51. D. Loftus Dublinienſis.
52. Coll. S. Trinitatis apud Dublinium, *&c.*

ſtorum equidem Catalogorum plurimi Typis Sheldoniis *jam impreſſi ſunt, ſed nondum exponuntur dum expectantur plures. Rogantur igitur viri literati literatorumque Patroni, ut velint, hoc Opus nobis ac poſteris non inutile, è Theſauris ſuis Librariis, quam primum poſſint, locupletare & ſupplere.*

OXONIÆ KAL. AUG A.D. 1694.
EDV. BERNARDUS.

VI. *A Diſcourſe of the Viper, and ſome other Poyſons, Wrote by Sr.* Theodore de Mayerne, *after Diſcourſing with Mr.* Pontæus. *Communicated by Sir* Theodore de Vaux, *M. D. and S. R. S.*

THe Venom of a Viper in it ſelf is not Mortal to a Robuſt and Sound Body; and tho very unhappy and miſchievous accidents attend it; as a great Tumour, Tenſion and Weight of the Part, Humidity and Variety of Colours, Phrenſies, Convulſions and Vomitings; yet in Eight or Ten days at moſt theſe accidents are over, although the Patient may be very ill, yet he recovers again; whilſt the Poyſon having run through divers parts of the body; at laſt it always throws it ſelf into the *Scrotum*, ſwelling it extreamly, cauſes a great heat and quantity of Urine, very hot and ſharp, by which it is diſcharged; this evacuation being the ordinary and moſt certain *Criſis* of the Diſeaſe: It is obſervable that the perſpiration being obſtructed by the Poyſon, a Man bit by a Viper and ſwelled up, in three or four days ſhall weigh almoſt as much more then he did before.

A ſickly Perſon under an ill habit of Body, or fearful, dies Infallibly, and in ſhort time by this Venom without ſpeedy help.

In the extream Nervous Parts, near the Pulſe and Tongue, the bites are dangerous, and accidents very painful.

Freſh Vipers that have not bit, but have the bladders of the Gums full of Venom, are the moſt Miſchievous.

Mountebanks to impoſe upon the People, either make their Vipers bite before they bring them out; or with a Needle ſcratch the Gums, and preſs out the Poyſon.

They make us believe that a bite on the left breaſt near the heart, is more mortal than elſewhere, but this is a cheat, it cauſing only a great ſwelling on all that ſide of the body, on the Neck and Face, which afterwards falls down (as was ſaid) into the Scrotum, and is evacuated by Urine.

For theſe great and painful ſwellings, the Remedy is to drink the Decoction of *Marrubium*, or the powder taken inwardly, and a fomentation with the decoction, applying the reſt on the place. *Ariſtolochia* is alſo a ſtrong and powerful Antidote againſt the Viper; ſo that if one be bit on the Tongue, he need only take a ſlice of this Root, heat it and apply it, and it goes away.

Pontæus a Chymical Mountebank, a Native of *England*, and an Apothecary by Trade, from whom I had the above mentioned Obſervations, was one day accidentally bit by a freſh Viper on his right wriſt; he thought it would have killed him; one of the greateſt pains he ſuffered was almoſt an inſupportable Tenſion of the palm of his hand.

He compoſed his Antidote of Extract of Juniper berries, drawn with a decoction of roots of round *Ariſtolochia*, of *Succiſa*, *Marrubium Album*, flower of Brimſtone and of white Vitriol.

For Poyſon not Corroſive, ſuch as thoſe of Animals and Vegetables, and even for the Plague it ſelf; (which he believes he can cure by the ſame Remedy), He makes uſe of no Vitriol. But if the Poyſon be ſublimate, which of it ſelf excites Vomiting, he adds Vitriol, not in a proportion to Vomit as a Drachme, but only a ſcruple or half a dram, the Vomiting being aſſiſted by the Corroſive Poyſon it ſelf.

To encreaſe the Value of this Antidote with the People, when the Experiment is made on Dogs; to that Dog which they would have dy of the bite of the Viper, he gives with the Antidote a quarter of a *Nux Vomica* not powdred, only cut in bits, and the next day the Dog dies. If it were powdered the Dog would dye in half an hour.

He ſays *Nux Vomica* is ſo called by contraries, for it never Vomits but ſhuts up the Stomach, and contracts the Nerves by its poyſon.

To preſerve the Dogs alive, you muſt give them with the Antidote or any thing elſe, three or four grains of ſublimate, which immediately ſets them a Vomiting, and ſo ſaves them alive.

He offers to take all ſorts of Poyſons, even Corroſives after an ordinary meal, and for a tryal of Skill he refuſes them not on an empty Stomach.

He much eſteems Morſus Diaboli, Succiſa or Devills-bit, againſt all ſorts of Poyſons; he laughs at the Poyſon of a Toad, which he ſays has none at all, no more then a Frog, and affirms he has eat ſeveral without any miſchief.

His Sugar or Remedy for Worms in Children, is fifteen grains of *Mercurius dulcis* with five grains of Scammony, and two or three times as much Sugar, made up in Lozenges.

He ſays, That this Doſe which in *France* purges grown Perſons, does nothing in *England* on thoſe above fifteen years old, and ought to be augmented.

His *Mercurius dulcis* is made without Vitriol, which tho good is yet Corroſive, he takes only aſhes with decrepitated Salt.

The manner of the acting of the Vipers Poyſon is thus: In about ¾ of an hour, a Syncope or Swooning ſeizes them with Tremblings and Convulſions, tingling of the Ears, and frequently Deafneſs for a moment; next as it were a white Sail comes before their eyes, which ſoon vaniſhes: On the place of the bite a ſwelling riſes at firſt of the bigneſs of a Pea, which grows as big as a Bean or a Nut, and increaſing inlarges it ſelf over the Neighbouring parts, to a very conſiderable Tumour and Streching of the fleſh, which grows *œdematous*, and by little and little falls into the Scrotum, and leaves the part black, blew, and yellow.

It makes as it were bags in the skin, which feel heavy when you walk as if filled with Quickſilver.

Do what you will the Poyſon will have its courſe, and is uſually three days before it comes to the heighth, and as long abating.

For theſe great ſwellings and ſtretching of the parts, a Fomentation and Cataplaſm is made with *Marrubium*, *Tapſus barbatus* and Agrimony.

The Gall of the Viper is no ways Venemous, and *Ponteus* ſays, he uſually gives it without any ill effect or trouble, but its bitterneſs; all the Poyſon is in a Liquor in the Gums, which is yellow like Oyl, of which you may eaſily diſarm the Viper.

The Viper is the moſt Venemous of Serpents, the *Aſp* is but a ſpecies of the Viper. The *Napellus* is a very dangerous Poyſon, acting by its Acrimony, but you muſt take a great quantity of it; it burns the throat extreamly as does Alum, but it is cured by the Antidote.

Crude Antimony does nothing if attacqued by the Antidote.

The moſt miſchievous of all Poyſons is Opium, of which having given an exceſſive quantity to his Servant, at firſt he had Convulſions, then ſtrange Vomitings, not able to let any thing go down into his Stomach, a ſleepineſs followed: all which time they kept him awake as much as poſſible. At laſt all of a ſudden he grew well, and called for Victuals.

Succiſa, or Devils bit, is excellent for Poyſons, eſpecially the Plague; and it is obſervable, that it is ſo powerful a Sudorifick, that laying the ſick Perſon whether of the Plague or other malignant Fever, on a Bed of that herb, moderately hot, he ſhall ſweat till they take him off, and much more if he drinks of the decoction or juice of the herb, which in Summer they take all, and in Winter of the root only.

He ſays, That for the Dropſy after all other things, one of the beſt Remedies in the World, is to take *Morſus Diaboli* and put it over the fire in a dry Kettle, that it may wet it only with its own juice, and of this to apply a quantity to the Belly and Reins of the Patient, covering him up warm, and ſo provoke ſweat; which will come away in great quantity, and may be maintained according to the ſtrength of the Patient, and Exigency of the Caſe.

VII. An Account of BOOKS, *Viz.*

An Account of ſeveral late Voyages and Diſcoveries to the South and North towards the Streights of Magellan, *the South Seas, the vaſt Tracts of Land beyond* Hollandia Nova, *&c. Alſo towards* Nova Zembla, Greenland *or* Spitsberg, Groynland *or* Engronland, *&c. By Sir* John Narborough, *Capt.* Jaſmen Taſman, *Capt.* John Wood, *and* Frederick Marten *of* Hamburgh. *To which are annexed a large Introduction and Supplement. The whole Illuſtrated with Charts and Figures.* London: *Printed for* Sam. Smith *and* Benj. Walford, *Printers to the* Royal Society, *at the* Prince's Arms *in St.* Paul's *Church-yard.* 1694. In Octavo.

ABout 14 Months ago theſe Bookſellers publiſhed a Curious Collection of Travels into the *Levant*, and other adjacent Countries, By *Rawolf*, *Belon*, *Greaves*, &c.

Of which the *Tranſactions* take Notice, N°. 200. *p.* 768. And having received Encouragement, do here proceed with the like Deſign upon other Parts of the World, in order to improve and compleat Geography from Original Authentick Records, and Memoirs of Eye-Witneſſes.

The preſent Collection reaching to the moſt diſtant Parts of the *Southern* and *Northern* Regions of the *Globe*, and being performed by Skilful *Navigators*, and Faithful *Obſervers*, muſt needs contain many uncommon and uſeful Things upon moſt of the Heads of Natural and Mathematical Sciences, as well as Trade and other Profitable Knowledge, which contribute to the enlarging of the Mind and Empire of Man, too much confin'd to the narrow *Spheres* of particular *Countries*, and therefore ſubject to great Miſtakes, and falſe Conceptions, for want of a large Proſpect of *Nature* and *Cuſtom.*

The Contents of the preſent Work are very various, and of vaſt extent, but may be reduced to theſe *Generals :* The *Introduction, The Voyages of Sir* John Narborough, *Capt.* Jaſmen Taſman, *Capt.* John Wood, Frederick Marten *of* Hamburgh, *and the Supplement :* Of which ſomething in Particular.

The *Introduction* gives a Compendious Chronological Account of *Navigations* and *Voyages* to thoſe Remote Parts, of which the Body of the Book treats, together with ſome new Reflections in *Geography, Hydrography*, and Natural Hiſtory.

Sir *John Narborough* touches upon the *Madera* and *Cape Verd Iſlands*, delineates and deſcribes the Coaſts of *Patagonia* and *Chili*, together with the Streights of *Magellan*, of which he took moſt exact Draughts, going frequently on Shoar, and up into the Country, obſerving the Products of the Land, the Manners and Tempers of the *People*, in order to promote and ſettle an Advantagious *Trade*, eſpecially in the Golden Country of *Chili*, eſteemed more Rich than *Peru* itſelf. In this

Voyage Sir *John* gives many Proofs of his Excellent Skill in the Art of Navigation, as to the Diſtances, Longitudes, Latitudes, Tydings, Magnetical Variations, *&c.*

Janſen Taſman was employed by the *Dutch Eaſt-India Company* to make Diſcoveries towards the *Southern Continent:* He touches upon *Van Diemen*'s *Land*, *Zelandia Nova*, &c. encompaſſing *Hollandia Nova*, and *New Guinea*, which appears to be a great *Iſland* by this his Circumnavigation. The whole courſe is drawn in a particular Chart, which the Bookſellers having procured, intend to ingrave it for the uſe of the Publick.

Captain *Wood* was ſent by King *Charles* the Second to Diſcover the *North-Eaſt Paſſage to China and Japan*, which he examines with great Induſtry, but being Wrackt upon *Nova Zembla*, was diſcouraged from further Enquiries. However he gives an Ingenious Deſcription of that Deſolate *Land*, and many Inſtances of his Generous Deſigns to Improve and Illuſtrate the dark *Phænomena* of the *Magnet*.

Frederick Marten of *Hamburgh*, undertook his Northern Voyage to ſatisfie the Commendable Curioſity of the *Royal Society*, which he has done with admirable Diligence; giving many *Specimens* of the Fertility of his *Genius* in making ſuch conſiderable Obſervations in the barren and horrid Climate of *Greenland*, as to the Weather, the Whale-Fiſhing, the Animals, Plants, and other parts of Natural Hiſtory; as alſo upon the Phyſical *Phænomena* of Snow, Ice, *&c.*

The *Supplement* was thought fit to be added, in order to compleat the *Northern Diſcoveries*, and render the Work more generally uſeful to thoſe who are delighted with *Geographical Studies*. It takes in all the *North-Weſt Diſcoveries*, performed by *Engliſhmen* and *others*; which being joyn'd with thoſe of the *North-Eaſt*, give a full Idea of that Part of the World, which is accurately drawn in an annext Map.

LONDON:

Printed for *Sam. Smith*, and *Benj. Walford*, Printers to
the *Royal Society*, at the Prince's Arms in St. *Paul's*
Church-yard. 1694.

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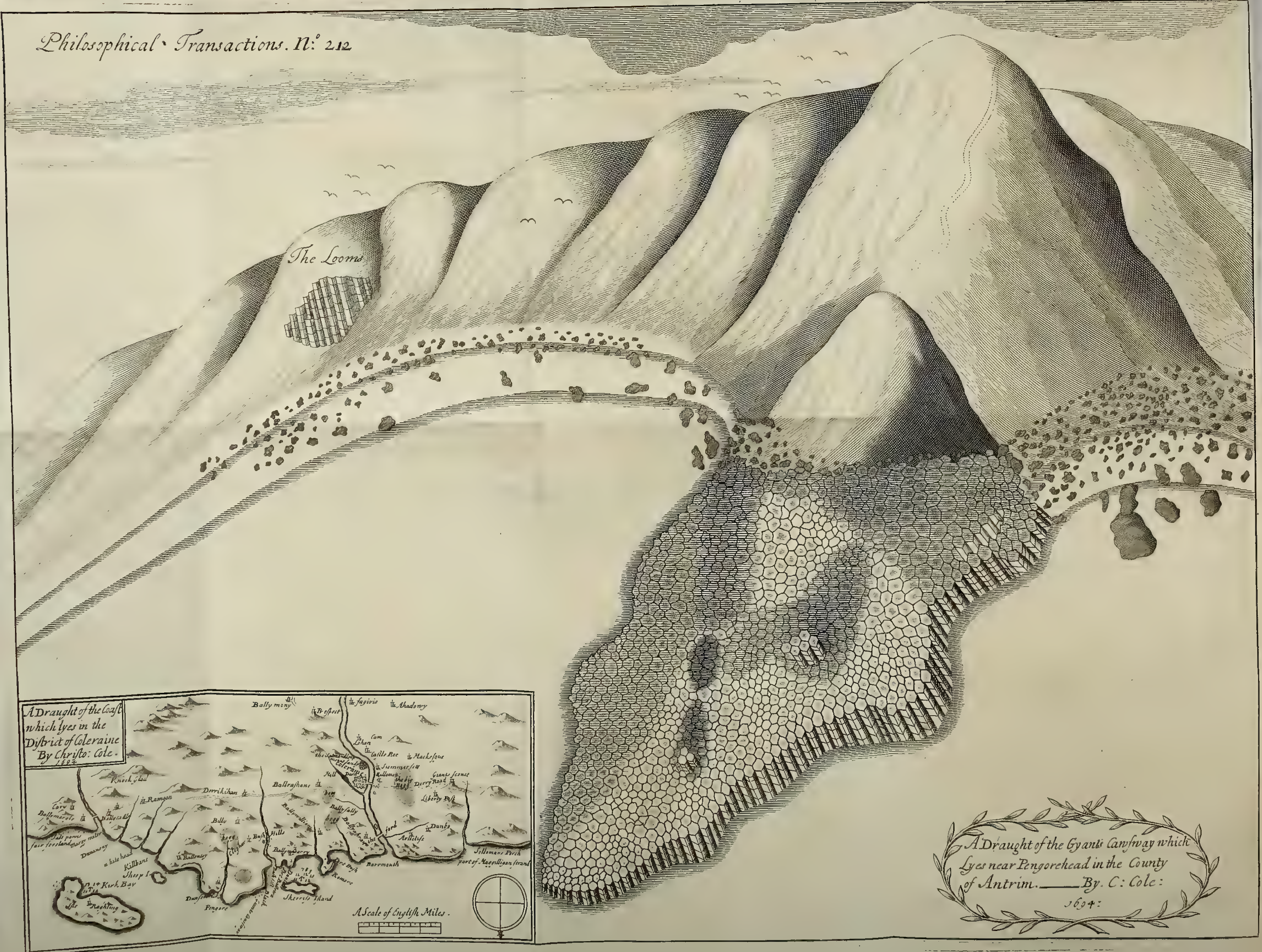

A Draught of the Coaſt which lyes in the Diſtrict of Coleraine By Chriſto: Cole. 1694

A Draught of the Gyants Cawſway which Lyes near Pengorehead in the County of Antrim. —— By. C: Cole: 1694:

BRITISH MUSEUM NATURAL HISTORY

PHILOSOPHICAL TRANSACTIONS.

For the Months of July *and* Auguſt, 1694.

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I. *An Account of the* Giants Cauſway *in the North of* Ireland: *By the Reverend Dr.* Sam. Foley.

THE *Giants Cauſway* is placed by Mr. *Cole* in the annext Map of the Sea-Coaſt of the Diſtrict of *Colerain*, ſomewhat more than Eight Engliſh Miles North-Eaſt from the Town of *Colerain*, in the County of *Antrim*, about Three Engliſh Miles from the *Buſh-Mills*, almoſt directly North. It runs from the bottom of an high Hill into the Sea, no Man can tell how far, but at low-water the *length* of it is about 600 Foot, and the *breadth* of it in the broadeſt place 240 Foot, in the narroweſt 120 Foot: It is very unequal likewiſe in the height, in ſome places it is about 36 Foot high from the level of the Strand, and in other places about 15 Foot.

It conſiſts of many Thouſands of Pillars, which ſtand moſt of them Perpendicular to the Plain of the Horizon cloſe to one another, but we could not diſcern whether they do run down under Ground like a Quarry or no. As to the Number of the Pillars, we could not gueſs that they are fewer than One Hundred Thouſand; but the ſhape of the Cauſway is ſo irregular, that we could not number the Columns of one ſide or end, in order to make a probable Computation of them all; *ſome are very long, and higher than the reſt, others ſhort and broke; ſome for a pretty large ſpace of an equal height, ſo that their tops make an even plain Surface, many of them imperfect, crack'd, and irregular; others entire, uniform, and handſome*, and theſe of different ſhapes and ſizes: We found none at all Square, but almoſt all Pentagonal, or Hexagonal; only we obſerved that a few had ſeven ſides; and many more Pentagons than Hexagons; but they were all irregular, for none that we could obſerve had their ſides of equal breadth; the Pillars are ſome of them 15, ſome 18 Inches, ſome two Foot in Diameter, none of them are one entire Stone, but every Pillar conſiſts of ſeveral Joynts or Pieces, as we may call them, of which ſome are ſix, ſome twelve, ſome eighteen Inches, ſome two Foot deep.

Theſe Pieces ſtand cloſe one upon the other, not joyning with flat ſurfaces; for when you force one off the other, one of them is always Concave in the middle, the other Convex. There are many of this kind of Joynts, which lye looſe upon ſome part of the Cauſway, and on the Strand, which were blown or waſh'd off the Pillars: Theſe Joynts are not always placed alike, for in ſome Pillars the Convexity is always upwards, and in others it ſtands always downwards. They always lye as cloſe as 'tis poſſible for one Stone to lye upon another, ſo that on the out-ſide of the Pillars you can but diſcern the crack that joyns the two Stones: When you force them aſunder, both the Concave and Convex Superficies are very ſmooth, as are alſo the ſides of the Pillars which touch one another: For when we pulled away ſome of the Pillars which ſtood outwards to the Weather, the ſides of the Pillars which ſtood next behind them looked as freſh as Stones newly hewen, being of a whitiſh Free-ſtone colour, but a finer cloſer gret; whereas when we broke ſome pieces off them, the inſide appeared like dark Marble.

The Pillars that are made up of theſe Joynts ſtand ſo cloſe one to another, that a Knife can hardly be thruſt in between the ſides of them; and though ſome have five ſides, and others of them ſix, yet the Contextures of them are ſo adapted, that there is no vacuity between them; the inequality of the Numbers of the ſides of the Pillars being often in a very ſurpriſing and wonderful manner throughout the whole Cauſway compenſated by the inequality of the Breadths and Angles of thoſe ſides: So that the whole at a little diſtance looks very Regular; and where in many places a good number of the Pillars are exactly of the ſame height, the Superficies of the tops of them looks very like the Pavements that are in ſome Gentlemens Halls, abating the irregularity of the ſides, but theſe lye as cloſe.

The Pillars, as I ſaid before, are ſome of them thicker than others, according as 'tis neceſſary to make them lye cloſe in thoſe various Figures, but every ſingle Pillar does retain its own Thickneſs, and Angles, and Sides from top to bottom; ſo that if one of them were cut Horizontally into never ſo many Segments, they would all have Sides and Angles exactly equal and parallel.

Thoſe Pillars which ſeem to be entire as they were Originally, are at the top flat and rough; thoſe which lye low to the Sea are waſh'd ſmooth; and others that ſeem to have their Natural tops blown or waſh'd off, are ſome Concave, and others Convex.

The Looms or Organs, as the Country People call them, mentioned in the Draught, are a parcel of ſuch Pillars as thoſe in the Cauſway, which ſtand in the ſide of a Hill at ſome diſtance from the Cauſway; the Pillars in the middle are longeſt, and thoſe of each ſide of them are ſtill ſhorter and ſhorter.

Anſwers to Sir Richard Bulkeley's *Queries relating to the Giants Cauſway, wrote down when we were upon the Cauſway.*

Quer. 1. W*Hether any of the Pillars are Hexagons, or whether there be any Squares, or whether they be all Pentagons only ?*

Anſw. The Pillars are compoſed of Stones which ſtand one upon another, ſome half a Foot, others a Foot, others a Foot and half, and two Foot thick; which are moſt either Pentagons or Hexagons all of them irregular, we ſaw no Squares, and but a few Heptagons.

Q. 2. *Whether any of thoſe Pillars have Joynts, and which have not ?*

Anſw. All the Pillars are compoſed of diſtinct pieces, which we may call Joynts, that lye upon one another as cloſe as 'tis poſſible for Stones to lye.

Q. 3. *Whether the Natural tops of theſe Pillars have any gravings upon them, or ſtriate lines, or are naturally ſmooth ?*

Anſw. The tops of the Pillars have no gravings or ſtriate lines; thoſe which are often covered with the Sea, are made ſmooth by the waſhing of it; but thoſe nearer the Land are flat and rough: Some of the tops are now Concave, and ſome Convex; but we ſuppoſe their Natural tops, which were rough and flat, are waſhed or blown off.

Q. 4. *Whether there be any Regularity in the ſides of the Cylinders of the ſeveral ſorts of Cylinders, and whether the ſides be not very unequal, ſome very broad, and ſome very narrow, as in the Planes of Cryſtals ?*

Anſw. The ſides of the Pillars are from top to bottom very ſmooth, but thoſe ſides are of unequal lengths, however they anſwer the ſides of the Pillars that ſtand next about them, ſo that they lye cloſe, and without any Interſtices. *Note, as a more full and further Anſwer to this Query, I find by the two Joynts of this Stone ſent hither to* Dublin, *that the ſeveral ſides of one and the ſame Pillar are as in the Planes of Cryſtals, of very unequal breadths or lengths, call it either, when you meaſure them Horizontally; and that in ſuch as are Hexagonal a broader ſide always ſubtends, or is oppoſite to a narrower, which ſort of Geometry Nature likewiſe obſerves in the formation of Cryſtals.*

Q. 5. *Whether the Mountain, or broken Cliff it ſelf ſhews any Beds of theſe Pillars in ſeveral Claſſes, or* ſtratum ſuper ſtratum, *the loweſt to the Sea being all Perpendicular; and how many Beds or Orders there are to make up to the top of the Mountain; or elſe whether they lye confuſedly, and on heaps, or obliquely?*

Anſw. The high Bank hanging over the Cauſway on that ſide which lyes next it, and towards the Sea, ſeems to be for the moſt part compoſed of the common ſort of Craggy-Rock; only we ſaw a few irregular Pillars on the Eaſt ſide, and ſome farther on the North, which they call the Looms or Organs; but juſt over the Cauſway we ſaw as it were the tops of ſome Pillars appearing out of the ſides of the Hill, not ſtanding, nor lying flat, but ſloping.

Q. 6. *What Beds of Earth are near them, or what other ſort of Stones above them?*

Anſw. No Beds of Earth, but all common Rock.

Q. 7. *What may be ſuppoſed to be the number of thoſe Pillars?*

Anſw. We gueſs they cannot be ſo few as One Hundred Thouſand; but the ſhape of the Cauſway is ſo irregular, that it is ſcarce poſſible to reckon them.

Q. 8. *Whether the Superficies of the ſides of the Pillars be Caniculate, or any other ways hollow'd?*

Anſw. Not at all, but ſmooth Planes.

Q. 9. *Whether the Cauſway conſiſts of only one* Stratum, *or Claſs of Pillars?*

Anſw. The Cauſway is very unequal both in height and breadth: The higheſt Pillars we ſaw we computed to be about 36 Foot high from the place where we ſtood on the Strand beſide the Cauſway; others not above 20, ſome 10 Foot, and ſome ſtill ſhorter, *though theſe do not ſtand according to Regular Orders, or different Claſſes:* We ſuppoſe each Pillar throughout the Cauſway to continue the ſame to the very bottom, for all that we ſaw on the ſides were ſo.

I have annext two Figures, drawn by Mr. *Cole*, Collector in thoſe Parts; one of the Cauſway, the other of the adjoyning Sea-Coaſt; which will make the whole much more Intelligible, and to theſe I refer you. He tells me, he has not drawn the Cauſway as a Proſpect, nor as a Survey or Platform, which he thought would not anſwer his Deſign, and that he has no other name for it but a Draught, which he took after this ſort: He ſuppoſed the Hills and Cauſway, &c. Epitomized to the ſame height and bigneſs the Draught ſhews them, and this he fancied the moſt Intelligible way to expreſs it. Thus far Dr. *Foley*.

Some Notes upon the foregoing Account of the Giants Cauſway, *ſerving to further Illuſtrate the ſame. By* T. Molyneux, *M. D. S. R. S.*

THis mighty large Pile of Stony Columns, that goes under the Name of the *Giants Cauſway*, I take not only to be as Remarkable a Natural Curioſity of its ſort as this *Country* affords, but perhaps as may be met with in *Europe:* For I cannot well imagine, that if a Foſſil ſo extraordinary in its kind were to be found

in

in any of theſe more civilized Parts of the World, that it could hitherto eſcape the many *Inquiſitive Naturaliſts*, that of late by their Induſtrious Reſearches and Writings have ſo plentifully embelliſh'd, and ſo far advanced the *Hiſtory of Nature* in all its parts.

But we muſt confeſs that this ſort of Learning has hitherto been much more diligently cultivated, as to the *Vegetable* and *Animal Kingdoms*, whilſt the *Foſſil* or *Mineral*, though ſcarce affording leſs Variety, has not been ſo carefully examined, but rather neglected. However ſo very notable a Production in Nature, as the Stones of this Cauſway, were it to be found at leaſt in any of our Neighbouring Kingdoms, I am confident could not have paſſed ſo long undeſcribed: And ſince 'tis a *Foſſil*, we muſt reckon it among the *Non-deſcripts*; I would not omit any thing that lay in my Power, which might the leaſt contribute to further Illuſtrate ſo very *Obſervable* a *Curioſity*, though I have never as yet been upon the place my ſelf.

But here it may not be amiſs at firſt, to obviate a groſs miſtake, I find not a few, though I confeſs ſuch only that are perfect ſtrangers to Natural Hiſtory, have been apt to run into, by thinking this great Pile of Stones ſo compactly put together, is rather the Workman-ſhip of Art and Mens Hands, than an Original Production of Nature; miſguided, I ſuppoſe, chiefly by the *Barbarous Name* the Superſtitious People of the Country have given it; who through Ignorance, do uſually aſcribe whatever is ſtrange and extraordinary, though Natural, to the working of *Giants*, *Fairies*, *Dæmons*, and ſuch like Imaginary Cauſes.

But if any one will in the leaſt conſider its Situation, adjoyning cloſe to precipitious Hills, not Acceſſible by Man without great difficulty; the way of its Courſe running ſtrait forward into the very Sea, and loſing it ſelf under Water; that there is not the leaſt ſign of

Morter, or any equivalent Cement, to joyn the Commiſſures or Sides of the Columns together; that there are no foot-ſteps of the ſtrokes of Tools or Chiſſels, in the Surface of any part of the Stone; that there are other parcels of the like Stone, which lye ſtill in their Native Beds, as they were firſt produced in the adjoyning Mountain. If, I ſay, one will but a little conſider theſe Circumſtances, I am ſure he can't imagine that *Men* could have the leaſt Deſign in putting all this uſeleſs Lumber in this moſt wonderful manner together in ſo Remote and Deſolate a place. And for ſuch, that will aſcribe it to *Giants*, or *Dæmons*, I think do not deſerve any Anſwer.

But nothing puts this point more out of Diſpute, than to make a little Enquiry into other Works of Nature of the like kind; where though perhaps we may find nothing altogether the ſame, yet we may obſerve ſome of her Productions, that at leaſt bear ſuch an *Analogy*, or Reſemblance to the Compoſition and Figure Remarkable in theſe Stones, that we ſhall eaſily conclude Theſe as well as They muſt certainly be the Architecture of the Regular Hand of Nature.

Among the ſeveral *figured Stones* already deſcribed by Authors, I find none that has more agreement with thoſe that compoſe our *Giants Cauſway*, than the *Entrochos*, the *Aſtroites*, or *Lapis Stellaris*, and the *Lapis Baſanus*, or *Baſaltes:* And yet for all the great Reſemblance they have in ſome particulars, they differ very much in others: I ſhall here therefore ſet down, for the more clearly underſtanding the above Deſcription of the Cauſway, wherein conſiſts the agreement and diſagreement between thoſe three ſorts of Stones, and this we are now more particularly treating of.

The *Entrochos* agrees with the Pillars of our Cauſway in that it's a Stony Subſtance, formed by Nature Columnwiſe, and conſiſting ſometimes of 20 or 30 ſeveral

Internodia, or Joynts ſet one a top of another; but then it differs in that its outward ſhape is round and Cylindrical, in its having a hole or Pith run from top to bottom through all the Joynts, in the ſetting on, or way of fitting one Joynt to another, and in its ſize and magnitude.

But the make of the *Aſtroites*, or *Lapis Stellaris*, ſeems to have ſtill a greater affinity in its Formation with our *Iriſh* Stones; for 'tis not only ſhaped Column-wiſe, as the *Entrochos*, and joynted with ſeveral *Internodia* cloſely adjuſted to one another, but its ſides are *Angular*, and the manner of the Commiſſures of one Joynt to another in ſome particulars more reſembles the way Nature obſerves in the Joynting of this Stone. *Boetius* in his *Gemmarum & Lapidum Hiſtoriâ*, ſpeaking of the *Aſteria vera*, or *Aſtroites*, has theſe words: *Plures ſimul cohærent articuli, ita concinnè, juncti & aptati, ut nullus Artifex melius jungere potuiſſet, ſeparari tamen facile à ſe invicem poſſunt.* Which is exactly agreeable to the joynings of our Stone; but then it muſt be obſerved, that the ſides of the *Aſtroites* are always ſulcated, or a little furrow'd, and are conſtantly *Pentagons*; whereas the *Iriſh* Stone has its ſides perfectly ſmooth, and plane, and ſometimes in *Hexagons* and *Heptagons*, as well as *Pentagons*.

Moreover if we Minutely compare the inward contrivance of two Joynts of the *Aſtroites* cloſing with one another, and two Joynts of this *Iriſh* Stone, we ſhall find a more conſiderable difference in the Commiſſure, than the external Superficies of both Stones at firſt ſight would ſeem to intimate. For the *Aſtroites* has furrow'd and protuberant Rays ſtriking from its centre, ſomewhat as they draw a Star, whence it has its Name, that adapting their Concavities and Convexities together, cauſe the cohæſion of the Joynts to one another; whereas the internal Superficies of the *Internodia* in our *Iriſh*

Stone ſends forth no ſort of Rays from its Centre, and unite to one another by a quite different Articulation, as may be gathered from the Deſcription: But here Dr. *Foley* has omitted one Remarkable Particular, that I muſt needs take notice of; for beſides what the Doctor Remarks of the bottom or top of each Joynt having a large round Concavity or Convexity, that extends it ſelf from the Centre of the Stone within an Inch or two of the Angular Circumference; examining two Joynts that were ſent up from the place hither to Town, I obſerved likewiſe, that the bottom or top of each Joynt round this Concavity or Convexity either riſes with an eminent Verge or Ridge, if it be Concave in the middle; or if it be Convex, is hollow'd with ſuch a ſort of Grove, as to receive cloſely into it all the eminent Ridge of the next Joynt either above or below it; ſo that each Superficies in the Articulations adapt themſelves on all ſides ſo exactly one to t'other, as 'tis poſſible for two Bodies, that are only contiguous, and not cohering, but moveable from one to another with little more force than is requiſite to ſtir a Body of that Gravity: But this peculiar moulding in the Joynts would be far better expreſt by a Scetch that ſhould exactly repreſent the bottom and top of two of them ſeparate from each other, than by any Deſcription conſiſting of never ſo many words.

Some of the Figures of the Plate-ſtones Dr. *Liſter* gives us in the *Philoſ. Tranſact.* N°. 100. ſeems to have ſome agreement to the Joynts of theſe Pillars, in being Hexagonal, and having in the middle, at top, or bottom, a round Concave or Convex Superficies, eſpecially that mark'd *Fig*. 32. but then 'tis much ſmaller, and he ſpeaks of it as a ſingle Plate, without any more Joynts found with it.

But the *Aſtroites* alſo as well as the *Entrochos*, differs extreamly from our Stone in its ſize, or magnitude;

for the largeſt that is found of either of thoſe kinds, do not much exceed the thickneſs of a Man's Thumb, whereas our Columns are ſome of them two Foot in Diameter.

Yet this diſproportion of bulk is not ſo conſiderable a difference, ſince we obſerve that Nature affects the like diſparity in other of her Works, and thoſe too nearly allied, and evidently of the ſame Tribe or Family. For Example, to inſtance a Compariſon taken from Vegetables, let us conſider the vaſt diſproportion between one of our ſmall joynted *Ruſhes* or *Reeds*, and the largeſt *Eaſt-Indian Bambon*, one of which I remember to have ſeen in *Holland* above 26 Foot high, and as thick as a Man's middle, and yet theſe are Plants all of the ſame Species and Claſs.

I choſe the rather to inſtance theſe kind of Vegetables that have joynted ſtems, on the account they ſeem to bear ſomewhat of Analogy or Reſemblance to the *Geniculated Mineral*, or *Rock-Plants* we are ſpeaking of, as I may call them with that accurate and experienced Enquirer into Natural Hiſtory, Dr. *Liſter*.

This affinity between Plants and Foſſils, will not ſeem altogether imaginary to any one that Judiciouſly conſiders, how the various Claſſes of Beings in the Creation, even from the perfecteſt to the moſt imperfect are link'd together, and as it were related by ſlow deſcents and Gradations from one to t'other; ſo that ſome of every Rank ſtill partake of certain immediate Properties, common to the Tribe above them, and below them, as well as their own: Thus, the *Monky* has ſomething of the *Man*, and *Quadrupede*; the *Batt*, of the *Bird* and *Beaſt*; the *Amphibious*, of the *Beaſt* and *Fiſh*; the *Hirundo Marina*, or *Flying Fiſh*, of the *Bird* and *Fiſh*; the *Molluſci*, and *Zoophyta*, of the *Fiſh* and *Plant*; and ſo of the reſt.

But to return to our *Giants Cauſway*; nothing among all the Foſſil Tribe that I have ſeen or read of, comes ſo nigh in all reſpects, in its Formation, Subſtance, Size, way of Growth, or manner of Standing, &c. to the Columns whereof 'tis compoſed, as the *Lapis Baſaltes Miſenus*, deſcribed by *Kentmannus* in *Geſner de Figuris Lapidum*, from whence *Boetius* takes both his Figure and Deſcription, whereof he ſays there is a great large Bed within three Miles of *Dreſden* in *Saxony:* He gives the following Account of it thus in his own words. — *Lapides anguloſi plures coagmentati* Baſalten *repræſentant, qui creſcit formâ & craſſitudine tigni mediocris, ſingularis quidem ſed copioſus, atque ita junctus coaptatuſque, veluti ab Arculario arte commiſſus eſſet; ſeptem, ſex, quinque, nonnunquam ſed rarius quatuor Angulorum: Omnino figurâ trabis erectæ, foris lævis, & tactu minime aſper, ferrugineus, ponderoſus, duritie velut adamantis; Hi Lapides ſic coagmentati è terrâ ulnas decem & ſeptem exſtant; quanto ſpatio intra terram condantur, nemini adhuc exploratum eſt.* Thus far *Kentmannus*; who could ſcarce in ſo many words have better deſcribed the Collection of Pillars, that make the *Giants Cauſway*, as if he had ſeen them on the place; Only I find this difference between them and the *Miſnean Baſaltes*, that its Columns were one entire Piece from top to bottom, and ſome of them four-ſquared; whereas our *Iriſh Baſaltes* is compoſed of Columns, whereof none are four-ſquared, and all of them divided into many Joynts. So that I think it may not improperly be called, to diſtinguiſh it from this and all other Foſſils,

Lapis Baſaltes vel *Baſanos maximus Hibernicus, angulis minimum quinque plurimum ſeptem conſtans; crebris articulis ſibi invicem affabrè conjunctis, ſed facilè ſeparabilibus, geniculatus.*

Whether our *Iriſh Baſaltes* can pretend to the Name *Baſanos* on the ſame account the *Miſnean* does, from the

Greek word Βασανίζω, *exploro*, becauſe it has the Property of the *Touch-ſtone*, that ſhews by lines drawn with Metals on its ſmooth Surface, which are Genuine, and which Adulterate, I cannot poſitively ſay; becauſe thoſe Pieces I have are ſo rough, that unleſs ſome part of the Superficies were Artificially poliſh'd, the Experiment cannot be made: Yet I have reaſon to believe it would ſucceed, were the Stone poliſh'd; becauſe I find *black Marble* in general, ſo it be of a cloſe Texture and hard, as this is, always partakes of that Property.

May the 19*th*. 1694.

POST-SCRIPT.

SInce my Writing of this, I find inſerted in one of the late *Philoſ. Tranſact.* N°. 199. that is but juſt come to my hands, a ſort of an Account of the *Giants Cauſway*, that is ſo full of Errors, and groſs Miſtakes, that nothing in it can be relied on; as where it ſays, *The Pillars do not conſiſt of Joynts, but are of one entire Piece*, where he calls them *Cylinders*, and a little after, *Cylinders with Angles*, and ſays, *ſome of them are four-ſquared*; of which ſort of Figures there is not one to be met with in the whole Number. But of this enough, which I have added only for Truth's ſake, that no one may be miſguided in this Piece of Natural Hiſtory by Miſtakes, or falſe Reports.

II. *An Account of the Evaporation of Water, as it was Experimented in* Greſham Colledge *in the Year 1693. With ſome Obſervations thereon. By* Edm. Halley.

IN order to explain the Circulation of Vapour Experimentally, I cauſed an Experiment of the Quantity of Vapour ariſing ſimply from the warmth of the Water, without being expoſed either to Sun or Wind, to be made in *Greſham Colledge*, which has been performed with great Care and Accuracy by Mr. *Hunt*, Operator to the Society: Having added up into one Sum the Evaporations of the whole Year, I find that, from a Surface as near as could be meaſured of 8 Square Inches, there did Evaporate during the Year, 16292 Grains of Water, which is 64 Cube Inches of Water, and that divided by 8 Inches the Area of the Water's Surface, ſhews that the depth of Water evaporated in one Year amounts to 8 Inches. But this is much too little to anſwer to the Experiments of the *French*, who found that it rained 19 Inches Water in a Year at *Paris*. Or thoſe of Mr. *Townley*, who by a long continued Series of Obſervations has ſufficiently proved that, in *Lancaſhire* at the foot of the Hills, there falls above 40 Inches of Water in the Years time. Whence it is very obvious, that the Sun and Wind are much more the cauſes of Evaporation, than any internal heat, or agitation of the Water. The ſame Obſervations do likewiſe ſhew an odd quality in the Vapours of Water, which is that of adhering to the Surface that exhaled them, which they cloath as it were with a Fleece of Vaporous Air, which once inveſting it, the Vapour riſes afterwards in much leſs quantity: which was ſhewed by the ſmall quantity of Water that was loſt in 24 hours time, when the Air was very ſtill from Wind, in proportion to what went away when there blew a ſtrong gale, although the Experiment were made, as I ſaid, in a place as cloſe from the Wind as could well be contrived. For which reaſon I do not at all doubt, that had the Experiment been made where the Wind had come freely, it would have carried away at leaſt three times as much as we found, without the aſſiſtance of the Sun, which might perhaps have doubled it. By the ſame Experiment it likewiſe appears, that the Evaporations in *May*, *June*, *July*, and *Auguſt*, which are nearly equal, are about three times as much as what evaporated in the four Months of *November*, *December*, *January*, and *February*, which are likewiſe nearly equal: *March* and *April* anſwering nearly to *September* and *October*. This Fleece of Vapour in ſtill Weather hanging on the ſurface of the Water, is the occaſion of very ſtrange Appearances by the refraction of the ſaid Vapours differing from that of the Common Air, whereby every thing appears raiſed; as Houſes like Steeples, Ships as on Land above the Water, and the Land raiſed, and as it were lifted from the Sea, and many times ſeeming to over-hang. And this may give a tolerable Account of what I have heard of ſeeing the Cattle at *High-water-time* in the *Iſle of Dogs* from *Greenwich*, when none are to be ſeen at *Low-water*, (which ſome have endeavoured to explain by ſuppoſing the *Iſle of Dogs* to have been lifted by the *Tide* coming under it.) But the evaporous *effluvia* of Water, having a greater degree of refraction than the *Common Air*, may ſuffice to bring thoſe Beams down to the Eye, which when the Water is retired, and the Vapours ſubſided with it, paſs above, and conſequently the Objects ſeen at the one time, may be conceived to diſappear at the other.

A TABLE ſhewing the Evaporations of Water, Anno 1693. *with the heights of the* Thermometer *and* Barometer *at* 8 *of the Clock each Morning.*

January.				*February.*			
D.	Grain.	Ther	Barometer.	D.	Grain.	Ther	Barometer.
1	31 ½	5	29, 7 Froſt.	1	36	29	30, 0
2	21	14	29, 7 ſome Ra.	2	27	26	30, 2
3	21	12	29, 7	3	33	25	30, 2
4	23 ½	8	29, 7	4	48	16	29, 9
5	23 ½	8	30, 1	5	30 ½	20	29, 9 ſome Ra.
6	26 ½	1	30, 5 Froſt.	6	26	16	29, 9 ſmall Ra.
7	31	— 3	30, 5 Froſt.	7	26	17	29, 8
8	25	— 5	30, 4 Froſt.	8	28	11	29, 9 a Fogg.
9	23	— 3	30, 4 Froſt.	9	23	16	30, 0
10	18	0	30, 4	10	26	20	30, 0
11	18	0	30, 4	11	39	8	30, 0
12	18	0	30, 4	12	40	5	29, 8
13	22	— 6	30, 3 Froſt.	13	52	— 1	29, 4 high Wi.
14	20 ½	— 7	30, 3 Froſt.	14	35	6	29, 2
15	21 ¼	—10	30, 3 Froſt.	15	35	11	29, 4 ſome Ra.
16	24	—15	30, 4 Froſt.	16	24	20	29, 2 Rain.
17	18	—13	30, 3 ½ Froſt.	17	39	20	29, 5 Rain.
18	18	—11	30, 2 Froſt.	18	39	19	29, 8
19	14	—10	30, 1 Froſt.	19	35 ½	17	29, 7
20	14	— 3	29, 6	20	35 ½	16	29, 3
21	21	0	29, 9	21	35	17	29, 0 Rain.
22	18	2	29, 9	22	29	10	29, 2
23	18 ½	0	30, 0 Froſt.	23	35	5	29, 3
24	18 ½	— 3	30, 0 Froſt.	24	37	1	29, 2
25	14 ½	9	29, 9	25	35	— 5	29, 4
26	14 ½	14	29, 7	26	23 ½	— 8	29, 0 Snow.
27	20	17	29, 2	27	21	—11	29, 4 Froſt.
28	36	10	29, 7	28	24	—14	29, 3 Froſt.
29	27 ½	15	29, 5 ſome Ra.				
30	27 ½	15	29, 7				
31	27	27	29, 6				

675 Grains.

690 ½ Grains.

March.

D.	Grain.	Ther	Barometer.
1	25	—12	29, 2 Froſt.
2	31 ½	—12	29, 1 Snow.
3	28	—13	29, 3 Sno.Froſt.
4	28	—12	29, 6 Froſt.
5	28	— 8	29, 3 Froſt.
6	20	— 1	29, 1
7	35 ½	5	29, 3 Rain.
8	39	9	29, 7
9	42 ½	8	30, 0
10	39	14	30, 0
11	33	21	30, 0
12	42	21	29, 8
13	42	22	29, 6 ½
14	46	23	29, 4
15	62 ½	14	29, 6
16	41	19	29, 5
17	42 ½	12	29, 4
18	50	10	28, 9
19	51 ½	7	29, 2
20	45	8	29, 2
21	41	7	29, 0
22	50	8	29, 4
23	37	10	29, 5
24	33 ½	6	29, 4
25	27 ½	7	29, 3
26	30	11	29, 4
27	57	9	29, 6
28	38	4	29, 6
29	30	17	29, 5
30	30	20	29, 4 ½
31	20	24	29, 3

1166 Grains.

April.

D.	Grain.	Ther	Barometer.
1	32	15	29, 4
2	39	15	29, 5
3	37 ½	14	29, 7
4	37	23	29, 6 ½
5	38	29	29, 2
6	29	32	29, 2
7	32	33	29, 3
8	32	35	29, 4
9	28 ½	40	29, 2
10	35	33	29, 4
11	37	33	29, 4
12	34	37	28, 9
13	39	32	29, 4
14	39	33	29, 5
15	39	29	29, 7
16	35	30	29, 8
17	37	31	29, 6 ½
18	36 ½	36	29, 4
19	33 ½	36	29, 3 ½
20	36	32	29, 3
21	39	37	29, 2
22	46	35	29, 4
23	42 ½	35	29, 5
24	52	35	29, 2
25	50	35	29, 3 ½
26	95	36	29, 7
27	38	44	29, 5
28	43	46	29, 7 ½
29	40	49	29, 6
30	52	42	29, 9

1203 Grains.

May.

D.	Grain.	Ther	Barometer.
1	56	36	30, 1
2	61	26	30, 0
3	66	21	30, 1
4	61	19	30, 1
5	52	31	30, 1
6	48	45	29, 8
7	59 ½	35	29, 8
8	51	34	29, 7
9	51	31	29, 6
10	43	35	29, 5
11	49	30	29, 5
12	54	32	29, 6
13	59	26	29, 7
14	59	32	29, 7 ½
15	46 ½	35	29, 7
16	46 ½	34	29, 8 ½
17	56	36	30, 1
18	70 ½	36	30, 3
19	58 ½	47	30, 1
20	76	50	30, 0
21	62	52	30, 1
22	73	64	30, 1
23	78 ½	64	30, 1
24	90	62	29, 9 ½
25	61	74	29, 9
26	67 ½	68	29, 9 ½
27	64	75	29, 9 ½
28	71	67	30, 1
29	80	69	30, 2
30	89 ½	70	30, 2
31	106	68	29, 9

1968 Grains.

June.

D.	Grain.	Ther	Barometer.
1	78	65	29, 9
2	85	62	30, 0
3	95	54	30, 2
4	77	52	30, 1 ½
5	63	50	29, 9
6	49	60	29, 7 ½
7	46	67	29, 7
8	63	63	29, 7
9	63	69	29, 8
10	63	71	29, 8
11	55	70	29, 8 ½
12	58	87	29, 8
13	59	75	29, 9
14	86	72	29, 7
15	63	79	29, 8
16	58	78	29, 9
17	86	79	30, 0
18	81	66	30, 0
19	92	57	30, 1
20	81	60	30, 0
21	80	71	29, 9
22	76	67	29, 8
23	63	69	29, 7
24	63	62	29, 6
25	57	65	29, 8
26	46	70	30, 0
27	49 ½	68	30, 0
28	52	74	30, 0
29	59	68	30, 2
30	62	69	30, 2

2008½ Grains.

July.

D.	Grain.	Ther	Barometer.
1	75	67	30, 0
2	75	67	30, 0
3	63	62	30, 0
4	62	61	30, 1
5	60	63	30, 1
6	74	65	30, 0
7	61	65	30, 0
8	51	65	30, 0
9	46	74	29, 9
10	52	77	29, 9
11	72	74	29, 8
12	74	82	29, 4
13	88	75	29, 7
14	83	62	29, 9
15	84	65	30, 1
16	84	68	29, 8
17	71	58	30, 1
18	77	65	30, 2
19	66	78	30, 1 ½
20	71	78	30, 1
21	72	82	30, 0
22	90	74	30, 0
23	99	68	30, 0
24	85	71	30, 0
25	85	81	29, 9
26	94	75	29, 9 ½
27	97	70	29, 8
28	81	78	29, 7
29	87	67	29, 9
30	78	64	29, 9
31	78	79	29, 3 ½

2335 Grains.

August.

D.	Grain	Ther	Barometer.
1	80	71	29, 5
2	77	73	29, 6
3	77	63	29, 8
4	78	64	29, 9
5	79	73	29, 9
6	81	70	29, 9
7	94	83	29, 6
8	79	86	29, 6
9	68	82	29, 7
10	70	83	29, 8
11	92	85	29, 8 ½
12	70	80	30, 0
13	81	73	29, 9
14	68	75	29, 7
15	69	74	29, 9
16	77	72	29, 8
17	77	77	29, 7
18	84	77	29, 7
19	86	64	29, 5
20	78	68	30, 0
21	68	67	29, 7
22	71	65	29, 7
23	75	55	29, 9
24	64	54	29, 5
25	63	57	29, 5
26	58	59	29, 4
27	60	55	26, 5
28	53	55	29, 9
29	53	58	29, 7
30	53	56	29, 7
31	63	48	29, 7

2246 Grains.

September.

D.	Grain.	Ther	Barometer.
1	53	53	29, 7
2	55	50	29, 6
3	61	50	29, 7
4	61	48	29, 7
5	63	44	29, 8
6	74	40	29, 7
7	62	39	29, 6
8	59	49	29, 5
9	40	52	29, 5
10	50	48	29, 6 ½
11	46	41	29, 7
12	48	43	28, 8
13	46	53	29, 7
14	43	57	29, 5
15	46	70	29, 2
16	49	54	29, 3
17	46	52	29, 1
18	52	45	29, 0
19	48	45	29, 3
20	50	44	29, 6
21	43	42	29, 9
22	41	51	29, 5
23	46	45	29, 9
24	44	52	29, 7
25	41	47	29, 8
26	43	47	29, 6
27	46	45	29, 7
28	47	40	29, 9
29	50	44	29, 8
30	40	42	29, 5

1495 Grains.

October.

D.	Grain.	Ther	Barometer.
1	40	35	29, 9
2	37	41	29, 6
3	41	35	29, 7
4	27	49	29, 6
5	29	48	30, 0
6	31	49	30, 2
7	29	58	30, 0
8	37	60	30, 0
9	39	59	30, 2
10	37	55	30, 1
11	34	55	29, 9
12	38	55	29, 8
13	39	42	30, 0
14	49	38	29, 8
15	44	28	29, 7
16	44	19	29, 7
17	35	23	29, 1
18	34	24	29, 2
19	34	20	29, 2
20	35	21	29, 5
21	35	17	29, 9
22	24	28	29, 7
23	28	25	29, 7
24	39	20	30, 0
25	41	13	30, 0
26	34	16	29, 9
27	33	13	30, 0
28	32	18	29, 8
29	33	10	29, 8
30	35	5	29, 7
31	28	7	29, 4

1095 Grains.

November.

D.	Grain.	Ther	Barometer.
1	18	22	29, 6
2	15	30	29, 7
3	24	34	29, 6
4	26	30	29, 7
5	33	21	29, 8
6	33	10	29, 8
7	29	9	29, 7
8	20	23	29, 5
9	21	21	29, 9
10	21	30	29, 7
11	32	27	29, 7
12	22 ½	34	29, 5
13	31	23	29, 4
14	25 ¼	15	28, 9
15	27	10	29, 4
16	25 ½	3	29, 6
17	26	— 7	29, 5
18	21	— 1	29, 5 great fog.
19	21	— 2	29, 5 great fog.
20	19	2	29, 6
21	15	5	29, 8 Fog.
22	11 ½	12	29, 7 ſome Ra.
23	20 ½	14	29, 7
24	24 ½	8	29, 8
25	24 ½	5	29, 9
26	33	—12	29, 9 Froſt.
27	33 ½	—12½	29, 9 Froſt.
28	27	—14	29, 8 Froſt.
29	42	—16	29, 8 } water
30	42	—17	29, 9 } frozen.

764 Grains.

December

D.	Grain.	Ther	Barometer.
1	34 ½	—16	30, 0 Froſt.
2	16 ¼	—10	30, 0 Rain.
3	12	— 0	29, 9
4	12	7	29, 4 ſome Ra.
5	17 ½	10	29, 2
6	33	15	29, 4 ſome Ra.
7	19 ½	15	29, 1 ½ (wind.
8	18	20	29, 0 R. & much
9	18	27	28, 6½ R. & ſtor.
10	25	16	28, 9 ſome Ra.
11	28 ¼	13	29, 6
12	28	9	29, 5
13	25	14	29, 2
14	15	20	29, 2 ſome Ra.
15	19	20	29, 5
16	22 ½	15	29, 5
17	17 ½	20	29, 5
18	21 ½	10	30, 1
19	22	3	30, 0
20	16	6	29, 8
21	14 ½	9	29, 6
22	16 ½	14	29, 3
23	22	11	28, 5 Stormy.
24	23	4	29, 0
25	22	0	29, 5 Froſt.
26	22	5	29, 2, Rain.
27	16	10	29, 3
28	20	6	29, 0
29	25 ½	0	29, 2 Froſt.
30	19 ½	5	28, 6 Stormy.
31	24	7	29, 2

646 Grains.

Note, That in the Column of the Thermometer , — denotes degrees of Cold below the freezing Point ; and that from the 10th. *of* November *to the end belong to the foregoing Year* 1692.

III. *A*

III. *A Letter from Sir* Dudley Cullum, *to* John Evelin, *Eſq; concerning the lately invented Stove for preſerving Plants in the Green Houſe in Winter, publiſhed at the end of the* Calendarium Hortenſe.

S I R,

I Cannot but think my ſelf obliged in Gratitude to give you an Account how well your lately invented Stove for a Green Houſe ſucceeds (by the Experience I have had of it) which certainly has more Perfection, than ever yet Art was before Maſter of. Sir, I have purſued your Directions in laying my Pipes (made of Crucible Earth) not too near the Fire-grate, which is nigh upon, or better than ſixteen Inches; and by making a Trench the whole length of my Houſe, under the Paving (for the Air to iſſue out and blow the Fire) of a convenient breadth and depth (that is, 18 Inches both ways, cover'd with an Arch of Bricks) and at the other end of the Trench, having a ſquare Iron Plate anſwerable to that of my Paving (which is 18 Inches) to take off and put on, with a round hole at each corner, of about 3 Inches Diameter, with a Lid to ſlide open, and ſhut, upon every end of them, (as you may have ſeen upon ſome Porridge-Pot covers) ſo that by opening any of theſe holes, or all of them, more or leſs, or taking off the whole Plate, I can releaſe ſuch a quantity of Air out of the Houſe to blow the Fire ſo, as to increaſe or diminiſh the blaſts; and, as you were pleaſed by Letter to inform me, concerning diſtributing the Air at its admiſſion more equally through the Houſe, I have inſerted my Pipes into a Channel all along the Wall at the end of the Houſe, with thoſe ſeveral Overtures you mentioned: All which, Sir, I aſſure you, prove moſt admirably well, as by this free and generous Communication of yours you muſt have highly obliged all the Lovers of this Recreation, as well as, *S I R*, *Your moſt Faithful and Humble Servant*,

D. Cullum.

IV. *A Poſt-ſcript of a Letter, bearing Date* Auguſt *the* 4th. 1694. *from* Warrington *in* Northampton-ſhire.

ON *Wedneſday* laſt (being the firſt Inſtant) there happened here, betwixt the hours of One and Two of the Clock in the Afternoon, a very terrible Whirl-wind amongſt the Shocks of Corn, in that part of *Acrement Cloſe*, which is in the Poſſeſſion of Mr. *Holt*, and took up into the Air about 80 or 100 Shocks, carried a great deal quite out of ſight, the reſt it ſcattered about the Field, or on the tops of the Houſes or Trees thereabouts. I have ſeen of the Corn, which was carryed a Mile diſtant from the Field; and it is reported by Perſons of good Credit, that ſome was carryed four or five Miles diſtant. The Whirl-wind continued in *Acrement Cloſe* full half an hour; I my ſelf, and ſeveral other Perſons ſaw at leaſt three or four Waggon-Loads of Corn all at once whirled about in the Air.

The Letter was written to a Reverend Divine now in *London*, from an Inhabitant of *Warrington*, a very Sober and Credible Perſon.

LONDON:

Printed for *Sam. Smith*, and *Benj. Walford*, Printers to the *Royal Society*, at the Prince's Arms in St. *Paul's* Church-yard. 1694.

BRITISH MUSEUM
NATURAL HISTORY.

BRITISH MUSEUM NATURAL HISTORY

PHILOSOPHICAL TRANSACTIONS.

For the Months of September *and* October. 1694.

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I. *An Extract of a Letter from Monſieur* Anthony Van Leuwenhock *to the* Royal Society, *containing the Hiſtory of the Generation of an Inſect, by him called, The* Wolf. *With Obſervations on Inſects bred in Rain-Water, in Apples, Cheeſe,* &c.

THE *Wolf* is a ſmall white Worm armed with two red Sheers or Teeth at the fore-part of its Head, wherewith it bores and ſeeds on the Grains of Corn, and makes its way through Wood it ſelf.

Having formerly often incloſed ſome of theſe Worms with ſome Wheat in ſmall Glaſs Tubes (which I carried in my Pocket in the Winter) I always found that they dyed before the time of Generation: Wherefore in the Summer I put ſome of them with the Wheat whereon they fed in a Box, and obſerved that one of them joyned ſix or eight Grains together, lodging it ſelf in one of them, the reſt being likewiſe all hollow and eat out. The Worm ſpins a Thread, wherewith it joyns the Corn together, and faſtens it ſelf to Glaſs or other ſmooth Bodies. When I put them in Boxes, they eat their way out; and when I put them in Glaſs Tubes, they bored through the Corks that ſtopt the Glaſs Tubes; to prevent which, I covered the Cork with Sealing-wax, and to give them Air, put a very ſmall Glaſs Cane thro' the Wax and Cork. *Fig.* 1. *ABCD* is the Tube ſtopt with Wax and Cork, *EG* and *FH* two ſmall Pipes paſſing through the Cork and Wax. The Beams of the Granaries likewiſe are all eaten, for they leave the Corn, and creep up the Walls to the Timbers of the Ceiling, where they faſten themſelves and remain till their Change.

The Worms in my Glaſs Tube, which was about a Foot long, and a Finger wide, faſtened themſelves to the ſides of the Glaſs, and lay ſtill all the Winter; the Web that covered them was ſo thin, that I could with my Microſcope perceive a ſmall motion of their Heads through it.

On the 29*th*. of *April* following they began to look red, and ſomewhat ſhorter than before; on the 30*th*. they were redder, and changed into *Aurelia's*.

On the 23*d*. of *May* they were of a dark red, and on the next day one of them was changed into a ſmall Moth, leaving its uſeleſs Skin, or Winter-coat. This Moth had white Wings with black ſpecks; my Microſcope diſcovered theſe Wings to be covered on both ſides with Feathers, whereof ſome were tipt with black. The Moth had four Wings, each Wing adorned with three rows of Feathers very long in proportion to the little Creature, and each row increaſing in ſize above the other; every Feather was not round at the end, but indented Tooth-like. Theſe Moths are repreſented *Fig*. 2. *A A*. and the Skins they left. *Fig*. 3. *P Q*. of the Natural ſize.

On the 25*th*. of *May* I put into ſeveral Tubes a Male and Female Moth, which might be known aſunder from the Males being ſmaller; and after they had coupled, I opened ſome of the Females, and found between Fifty and Seventy Eggs in each.

On the 26*th*. I found in my fore-mentioned Tube ſix Moths flying; on the 27*th*. I found one Moth had laid nigh Seventy Eggs, each of the ſize of a ſmall Sand, and of the ſhape of an Hens-Egg. The manner of laying their Eggs is by ſtretching out their hinder part, as *Fig*. 4. from *A* to *B*, then thruſting out the Part, *B C D*, and out of that the Part *C D E*, which Extremity is beſet with ſeveral hairs, as at *E* is repreſented: This Part *B C D E* was ſeveral times put out and in, and at laſt it brought forth an Egg, which being ſoft, was extended in its paſſing through the narrow paſſage, and the *Ductus* it ſelf enlarged, as *Fig.* 5. *G H I.* I ſuppoſe that it places the Eggs by the means of this long ſlender Member in the creaſes of the Grain, to ſecure them the better from external Injuries. *Fig.* 4. *E.* and 5. *I.* repreſents an Egg when 'tis laid and fixt down by a clammineſs it has when new laid: Soon after they had laid their Eggs the Moths dyed.

Thoſe Eggs that were laid on the 26*th.* of *May*, by carrying in my Pocket next my Body in a Glaſs Tube, were by too much heat ſpoiled, the Worms that were in them being kill'd; wherefore I put them in a cooler Pocket, and on the third of *June* found ſome of them hatcht, and the Worms creeping on the Glaſs. I cauſed one of theſe to be drawn, but not with all the Curioſity of its Parts, *Fig.* 6. *K L.* The fore-part of this Worm was furniſht with ſix Feet, as is repreſented *Fig.* 7. *M N.* The true ſize of this Worm, when firſt hatcht, was of the length of the line in *Fig.* 8. which was double the Diameter of the Egg.

I gave them ſome Grains of Wheat, wherein they ſoon houſed themſelves: The ſhell of the Egg when the Worm is hatcht is drawn by a much more enlarging Microſcope, *Fig.* 9. *R S T V*, whereon the Net-work of the Veſſels may be ſeen.

I have obſerved that of great numbers of Feathers ſcattered by the Moths they all appeared of a different ſhape and ſize, *Fig.* 10. *A B. C D. E F.* are three of the largeſt Feathers magnified: At the broad end they were ſomewhat blackiſh, ſo that lying one over another, they made a black ſpot. The other Feathers, as *Fig.* 11. *G H. I K. L M.* were white and tranſparent; all theſe Feathers have their Quills, by which they are faſtened into the Membranous Wings: *Fig.* 12. repreſents Ten diſtinct Feathers differing in ſize and ſhape. Thoſe on the edge of the Wing were longer than the others, and of a particular ſhape, *Fig.* 13. ſhews five of them.

Thoſe Eggs which were laid about the *25th.* of *May*, and were not kept warm, but laid in my Cloſet-window, were not hatcht till about the *10th.* of *June*; ſo that the warmth of the Body haſtens their hatching.

The Corn-Merchants obſerve them not till about *Auguſt*, though they are hatcht in about ſixteen days after the Moth flies about, and are not perceived by reaſon of their ſmallneſs, and their hiding themſelves in the firſt Grain of Corn that they eat into, and are not ſeen till they quit that for another.

Theſe Worms are not only deſtructive to Corn, but are alſo in old Timber, Books, Boxes, Woollen Stuffs, and the like.

This being ſo Deſtructive and Prolifique an Inſect, for of Seventy Eggs I found but one Barren, and three with dead Worms, I thought of a way to deſtroy them, which is thus: I took a Glaſs Veſſel, and put into it Eight Moths, and firing ſome Brimſtone therein, they were ſoon kill'd by its fume: and three hours after putting ſome more Moths into the Veſſel, the Scent that remained therein kill'd them; from hence gueſſing at what might ſerve for a larger Room, I took for a Granary 24 Foot long, and 16 broad, ¼ of a Pound of ſuch Brimſtone, prepared ſo as Wine-Coopers uſe to do for their Casks, which (ſecuring it from danger of firing the Room) I placed in the midſt of the Room, and ſetting it on fire, left it, ſhutting the Door, and after two days I came again, and found ſome Moths alive on the Walls, but not a tenth of what uſed to be there, and which I judged might get into the Room through the broken Glaſs of the Window, or they might have crept out of the *Aurelia* after the Smoak was over: Wherefore the beſt way is to ſmoak the Room as ſoon as the Moth appears, and that for ſome days ſucceſſively, which is but a ſmall charge. And in *Autumn* it would do well to ſweep the Worms off the Walls, for being a tender Inſect, they are eaſily kill'd.

At the time of the Wolfs creeping up the Walls I ſaw many ſmall Animalcules of the ſize of a great Sand upon the Walls alſo; they had their hinder part broad and ſhort like a Louſe, and four Horns, whereof two were almoſt as long as their whole Body, and the other two not above $\frac{1}{3}$ of that length. Theſe Animalcules laid ſmall Eggs, in ſhape almoſt of a Lemon: They were not long-lived, poſſibly for want of their proper Food, for ſome of them had eaten others for Hunger: Theſe Eggs were hatcht in *May*, and the Young ones were of the ſame ſhape with their Parents, ſo that theſe Inſects produce their like, as do Lice, Mites, Fleas, *&c.*

In Rain-water I obſerved a ſmall red Worm, and two other kinds of very minute Inſects; of thoſe of the larger ſize I judged that 30000 together would not equal a courſe Sand. Theſe I obſerved for ſeveral days, and ſaw them copulate, the larger dragging the ſmaller through the Water after them, ſwimming by the means of very ſmall Finns. I ſaw likewiſe another ſort of ſmaller Inſects in the Water coupled, twenty times more in number than the former.

As to Inſects bred in Apples, I obſerve that in the Spring, when the Trees begin to bud, a certain black Fly lights on the Bloſſoms, and lays its Eggs there, (our Gardiners ſay, they come moſt with a North-wind) others ſay, they come out of the Sea: I took off from a Leaf an Egg laid there by what we call a *Wittge*; it was of the bigneſs of a courſe Sand, its ſhell after the Worm is out, is repreſented *Fig.* 14. *G H M K L* being the part whereat the Worm had made its way: Of this Shell all the Rib-like parts appeared hollow, and moſt likely are Veſſels. This Inſect flies from one Bud to another, and I doubt not but if we did obſerve theſe black Flies, and the Caterpillars which ſoon follow them, we ſhould find that the Caterpillars generated by black Flies, change to black Flies again.

About two Years ſince I put ſome Cheeſe-Maggots in a Glaſs Tube in my Pocket, and at laſt found the Maggot turned to a red *Aurelia* from pure white; and theſe again changed into a black Fly; which Experiment I oft renewed with the ſame ſucceſs, though I could not keep theſe Flies till they laid Eggs, it may be for want of convenient Food.

From theſe and ſeveral other Obſervations, I conclude there is no Generation but from the Parent Animal.

A CATALOGUE *of thoſe Oyls that will take Fire with a great Noiſe and Exploſion, when the Compound Spirit of Nitre is poured upon any of them, and of thoſe Oyls that do only make a great Noiſe with Exploſion, but will not take fire; and alſo of thoſe that do not make either Efferveſcence or Exploſion. The firſt is marked with two Stars **. The ſecond with one *. The laſt has no mark at all.*

- Oyls, Vegetable.
  - Eſſential.
    - Perfect Stillations made by the Analyſis of Chymical Fires, where the Oleaginous Particles are truly ſeparated from all other,
      - Light, or Æthereal, which are ſpecifically lighter than Water and Brandy, and ſome than Spirit of Wine, and are uſually drawn from the Seeds of Vegetables: Such as from
        - Seeds.
          - Carui **
          - Cummin *
          - Fenil *
          - Dills. *
        - Berries.
          - Juniper *
          - Bay *
        - Tops of Plants.
          - Thyme *
          - Wormwood *
          - Angelica *
          - Hyſſop *
          - Lavender *
          - Roſemary *
          - Peny-royal *
          - Rue *
          - Sage *
          - Savin. *
        - Fruits.
          - Lemons *
          - Oranges *
          - Nutmegs *
          - Cloves **
      - Ponderous or heavy, which do commonly ſink in Water, being diſtilled from the heavy Parts either of the Wood or Cortex of Trees. Such as from ☞
        - Wood.
          - Saſſafras **
          - Guajacum **
          - Box **
          - Camphire **
        - Cortex.
          - *Jamaica* Pepper **
          - Cinamon **
  - Not Eſſential.
    - Imperfect, made by expreſſion, which are decompounded of ſeveral parts of the Plants.
      - As of ☞
        - Fruits.
          - Almonds
          - Olives
          - Wallnuts
        - Seeds.
          - Line
          - Rape
- Animal of
  - Solid Parts
    - Hartſhorn **
    - Man's Skull **
    - Hoofs **
  - Fluids, Humane Blood **
- Mineral of
  - Amber or *Succinum.*
  - *Petroleum.*
  - *Barbados* Tarr.
  - Bees-Wax.

Spirit of Wine will give ſome flaſhes of Fire.

Balſam of Sulphur, a Compound Body made with Oyl of Turpentine and Brimſtone, if not too thick, will flame.

☞ You have Twelve ſorts of Oyls that do make Ebullition, Exploſion, and Flame; Eighteen, Ebullition and Exploſion without Flame; Four that produce neither; by the Mixture of our Compound Spirit of Nitre.

II. *An Account of ſome Experiments relating to the Production of Fire and Flame, together with an Exploſion; made by the mixture of two Liquors actually cold. By* Frederick Slare, *M. D. Cenſor and Fellow of the Colledge of Phyſicians: and of the* Royal Society.

I Gave an Account of ſeveral Experiments made by the mixture of various Liquors, ſome of them produced much Heat, others a great Ebullition with a cold Effect, others ſparks of Fire without Ebullition, and ſome few that did produce an actual Flame; but the difficulty to make the *Phoſphorus* (which was uſed in the greateſt of theſe flaming Experiments) is ſuch as has made that ſort of Experiment ſcarce Credible by ſome, and Practicable by few; in ſo much that I queſtion not but that it will be grateful to the Curious *Virtuoſo* of this Age, to ſee two clear Liquors both of them actually cold, without any intermediate or third Body, riſe up to a flame by kindling one another; beſides having made it eaſie for them to make or procure the Ingredients which perform this, not common Effect, it may yet be more acceptable.

Philoſoph. Tranſact. of the year 1683. Month of *Auguſt.*

The Experiment of Accenſion.

Take of any one of the Eſſential Oyls ſet down in the Catalogue, one part, of the Compound Spirit of Nitre two parts, (theſe may be Drams if you pleaſe) and they will with great Celerity and a great Noiſe produce a Flame, which laſts a very little while, but leaves an inſipid *Caput Mortuum*, as light and taſtleſs as a Cobweb.

But leſt we ſhould incur the Cenſure of thoſe that may attempt the making this Experiment, for want of ſetting down ſuch particular Directions as are neceſſary to make this nice and curious Experiment, ſucceſsful, I intend to be very plain and diſtinct both in the way and Method of preparing the ſeveral Spirits and Oyls that are uſed about it, and alſo as to the manner of mixing them.

1. This Experiment ſhould be made under a Chimney, or any convenient Draught, that ſo the offenſive ſteams may evaporate.

2. A Gally-Pot, ſpacious enough to hold four or five Ounces of Water, may be a convenient Veſſel for this Experiment, if you only uſe the forementioned Proportion; but if you pleaſe to uſe larger quantities, then you muſt enlarge the Veſſel.

3. You muſt put the Oyl into the Gally-Pot firſt, and then pour the Spirit on the Oyl, becauſe the Spirit being heavier, does the better paſs through the Oyl, and make a more Expeditious Mixture. This muſt not be dropt in gradually, but conveyed in altogether.

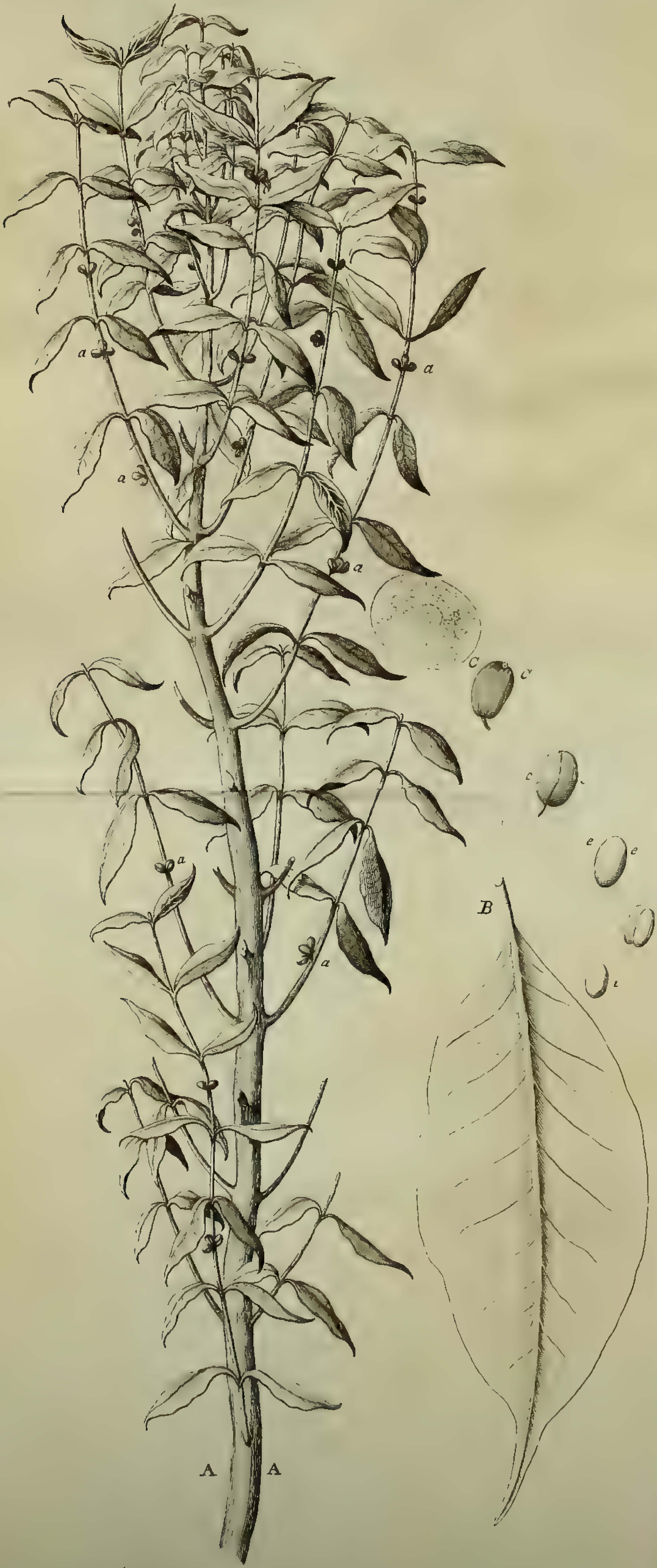
4. Hold not your Head too near the Gally-Pot, leſt the ſudden Exploſion of the Matter ſhould ſtrike up ſome of it into your Face.

5. The Compound Spirit will loſe much of its Vertue if kept too long.

The way of Preparing the Spirits for this Experiment.

Take of Salt-Peter and Oyl of Vitriol equal parts, and Diſtil theſe out of a Retort in a good Sand Furnace, ſo that the Sand continue red-hot for ſome hours, for the Fire cannot be too great; the Fumes will riſe of a very deep red colour, and will ſettle in the Receiver, in the form of a Liquor, which muſt be carefully preſerved from the Air; this being the Spirit with which all our

BRITISH MUSEUM NATURAL HISTORY.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our Experiments were made, which are referred to in the Catalogue.

To make the Common Spirit of Nitre, you need only to mix five or ſix times as much Clay as you take of Nitre, and Diſtill them in a Retort, and you may obtain a ſtrong Spirit of Nitre this way, eſpecially if you dephlegm it,and rectifie it to the beſt Advantage. With this we have made an Experiment of Accenſion ſucceed ſometimes, but with great uncertainty; but the firſt, which I call the Compound Spirit of Nitre, is only to be relyed on.

That Chymiſtry has been very pregnant in producing many good *Phænomena* very Serviceable to the better Explication of Natural Philoſophy, and alſo very uſeful in Preparing Medicines for Curing Diſeaſes, the Learned Men of this Age do generally allow; and that *Glauber*, though a very Chymiſt or Laborant, and nothing at all of a clear Philoſopher, has yet led on the beſt of Chymiſts, not only to make good Furnaces, but alſo other good Medicinal Preparations, I found the Matter of Fact the truer the more I peruſed him. He hints at the way of making this Compound Spirit of Nitre, and alſo the Compound Spirit of Salt, by Diſtilling them with Oyl of Vitriol, but after ſuch an Invidious and Ænigmatical manner, that he obſcures it all he can, and leads the Operator forward and backward on purpoſe to perplex him; which indeed has had this good Effect; That he has put us upon differing ways of Preparing this Spirit,and making it much more Noble than the Author did himſelf, who yet ſo over-valued it,as to think he had found the greateſt *Arcanum* in the World, and ſet this on the top of his Preparations, ſtiled, *Miraculum Mundi*, and the other Salt muſt be called *Sal Mirabile*; to which he attributes Twenty Six ſuch extraordinary Properties, as the Experimentors of this Age can no wiſe find, neither in his Salt, nor in the whole Creation. But had he been ſo Fortunate to have found out this Illuſtrious Experiment, it would have blown up his Fancy to ſome great Rapture.

Having got over this Digreſſion, I come now to attempt ſomething as to the Ætiology of this Experiment, and will firſt endeavour to find out what ſhare our Compound Spirit of Nitre has in making this *Phænomenon*, and then will ſubjoyn my thoughts about the Oyls.

This Compound Spirit ſeems to be the Active Principle that ſtirs up the Oily, or more Paſſive Particles to take fire, which will more eaſily be agreed to, if we conſider that our Compound Spirit of Nitre does not only conſiſt of all thoſe igneous Particles to be found in Common Spirit of Nitre, but that it has alſo all thoſe igneous Particles which Oyl of Vitriol contains in it, crouded into our Spirit of Nitre made this way.

For further Illuſtration,let us conſider what Oyl of Vitriol is. It is a Creature of the Fire: That the Sulphur, which is plentifully in Vitriol,or in Copperas,is accended, and afterwards diſtilled over in the form of a Liquor, which is a liquid ſort of Fire,as having many Properties of it.If you put it to Water it will make it boyling hot; it burns not only Linnen and Woollen, but Wood to a Coal, and ſcarce ſpares any thing.

Nitre, the other Ingredient of our Spirit, is very ſuſceptible of Flame, which does alſo incorporate many igneous and corroſive Particles after it has ſo many hours lain ignited in the Fire, comes over, by Diſtillation, very highly impregnated with the ſame fiery Particles; which is obvious to any one that has uſed to make Experiments with it. For Nitre it ſelf has no diſſolving or heating Quality, but is a great cooler, and ſcarce can be reckoned amongſt Acids; but after it comes out of the Fire in the form of a Spirit, it tears in pieces almoſt all Metals, and brings them to a ſort of Fuſion, as actual

Fire does; it diſſolves Animals, and Vegetables, and Minerals; and has many Effects of Fire. Therefore from an Union of theſe two very fiery Spirits reſults a much greater quantity of igneous Matter.

That Fire is very apt to incorporate with Fluids, and even ſuch as have had but a ſmall Communication with it, an Experiment which I formerly exhibited at a Meeting of the *Royal Society*, makes probable.

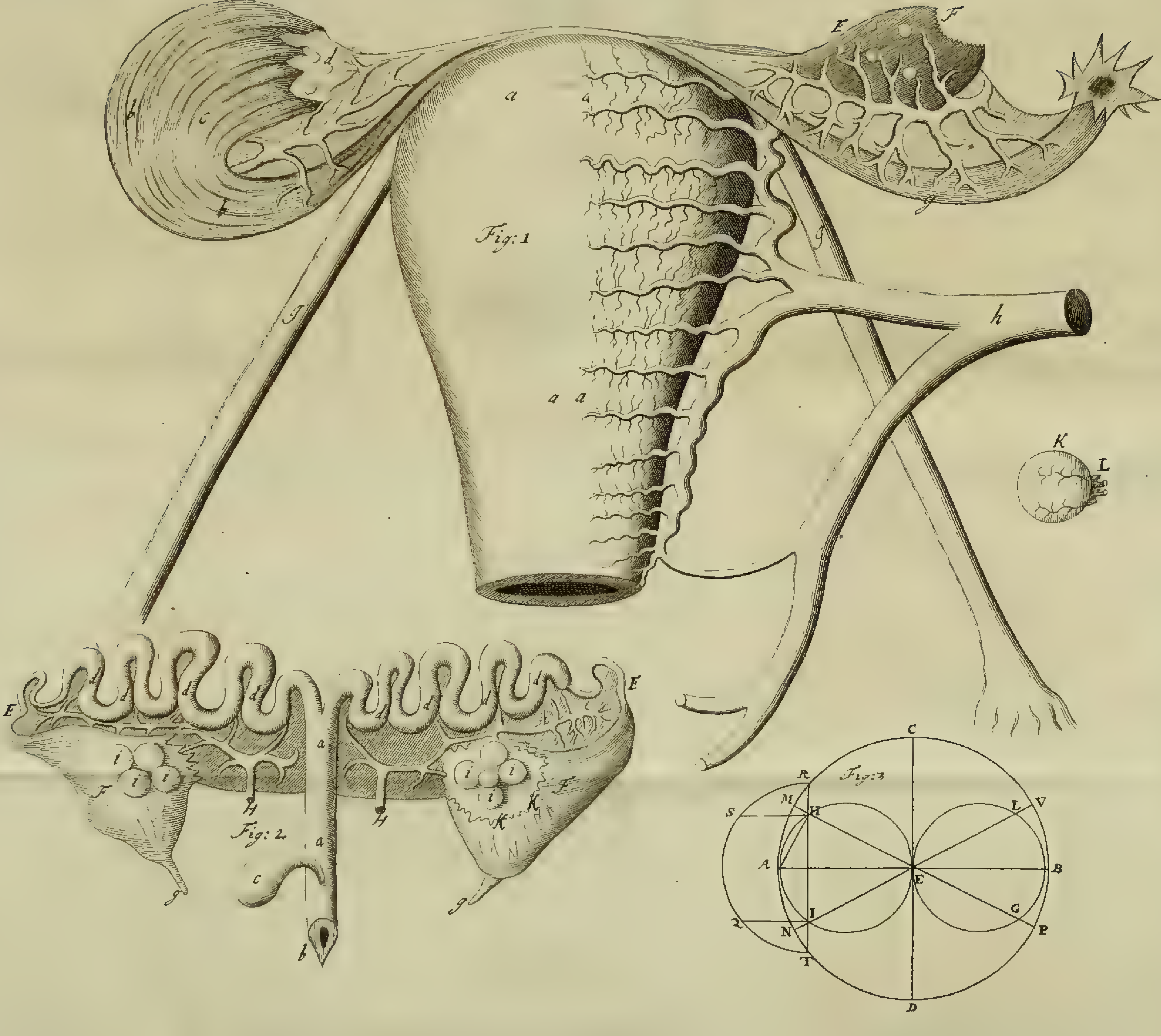
We took of Spirit of Wine that was highly rectified a Wine-Glaſs half full, and placed a tender Weather-Glaſs or Thermometer in the Glaſs, and then put a Spoonful of Water to it, this immediately warmed the Liquor, and made the Weather-Glaſs aſcend two Inches at leaſt: The Liquor in the Weather-Glaſs ſubſided as the other Mixture grew cold. I made it more ſenſible to the Touch by filling the Palm of the then Preſident's Hand with Spirit of Wine, and putting a ſmall quantity of cold Water into the ſame Hand, which made it ſenſibly warm his Hand, as well as others that made the Tryal. But from this Spirit, which is too Volatile to endure much Communication with the Fire, you may expect only a mild tepid heat; I am apt to believe, that there is ſcarce any thing which lies long in the Fire, but is apt to retain ſome igneous Particles; which does appear to be ſo in all fixed Salts, in Quick-Lime, and more particularly in Iron. If you take a Bar of Iron, though of a Hundred Years old, and file off about a Pound of it, and then you do mix and imbibe theſe Filings with a due proportion of Water, enough to make the whole juſt moiſt; the Fire, which all this while lay concealed in the Iron, being more diſpoſed to enter into the fluid, does by theſe means warm the whole Maſs. The Iron gained this heating Quality by Fuſion in thoſe fierce Fires which firſt ſeparated the Metal from the Ore. For it is not in the Nature of the Ore before Fuſion to emit any heat, as I have found by mixing Water with it.

There are a great many other Inſtances which make it very plain that Fire will add both to the bulk and weight of Bodies; but theſe affect Solid Bodies more manifeſtly. The Effect it ſelf produced by our Fluid does neceſſarily prove the inherent fiery Particles to have cauſed the Accenſion.

And this leads us to the other part of our Matter, which in conjunction with the Compound Spirit cauſes this Accenſion and Exploſion.

But here it will not be amiſs to premiſe a diſtinction of Oyls into Vegetable, Animal, and Mineral; having made ſome Experiments with all theſe, but moſt of all with Vegetable; for which reaſon we ſubdivide again the Vegetable into thoſe made by Expreſſion, and thoſe made by Diſtillation: And of thoſe made by Diſtillation we diſtinguiſh thoſe that are made out of the Seeds from thoſe that are made out of the Trunks, or Cortex, or Roots, or any other part of the Vegetable. We further obſerve a difference betwixt thoſe Seeds that have only a fragrant ſmell and a pungent taſt alone, from thoſe that have both Odorous Emanations and a brisk Taſt together, and thoſe that are inſipid, and have no ſmart Taſt.

In the firſt place we muſt ſet aſide thoſe Oyls made by Expreſſion. For having tryed Oyls of Line-ſeeds, of Nuts, of Olives, of Almonds, &c. we found theſe would not make Exploſion or Ebullition, or ſo much as any Fermentation with our Fiery Meteor. Nor could I without much ſtirring bring them to incorporate: And when they did incorporate the heat was but juſt ſenſible, and the reaſon may be becauſe this ſort of Oyl, though allowed to be a true *Pabulum flammæ*, for it may be made to flame alway, yet it is not a true Oyl, although it muſt be allowed to have one Property of Oyl, that it mixes not with Water; yet it doth not ſtand the Teſt of the Fire, for if you Diſtil it, you may part from it Water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Water, and Earth, and Soot, and a true Eſſential Oyl, which afterwards will bear repeated Diſtillations without any further diſſolution.

Having ſet by theſe Vegetable, but not Eſſential Oyls, we will briefly examine the Mineral Oyls, of which there are ſome, as Oyl of Vitriol, Oyl of Sulphur *per Campanam*, that have not any Property of Oyls, but are rather Acids, and Corroding *Menſtruums.* There are others that have the true Property of Eſſential Oyls, as *Oleum Petreoli*, and *Barbadoes* Tar highly rectified, which do not produce any Remarkable Heat, much leſs make an Ebullition or Exploſion: Nor does that active Oyl of Amber do any thing more.

The ſtillatitious Oyl of Bees-wax had much the ſame Effect when it was incorporated with our Compound fiery Spirit: And this inclines me to believe that the Wax it ſelf may be a Compound more belonging to a Mineral than Vegetable Nature.

And now we will examine thoſe Eſſential Oyls, which do produce great Ebullition, Exploſion, and Flame, with the Compound Spirit. Of theſe we have two ſorts, Vegetable and Animal.

The true Vegetable Eſſential Oyls do all of them make violent Ebullition and Exploſion, and ſeveral do actually take fire and Flame, as the Catalogue of Experiments do ſpecifie.

If it be enquired into, what ſhare the Oyl has in producing this Fire, whether only it be a *Pabulum*, or Fewel, for the Spirit to actuate, and ſo be meerly Paſſive? Or whether it contributes any Particles that do help to excite this Flame?

In order to reſolving this Doubt, we conſider, That theſe Eſſential Oyls are produced from Seeds that have very active or warm Parts or Spirits, ſuch as will eaſily ferment and heat, and have a warming Influence upon our Tongues, and do give heat to the Stomach and

Blood of Animals. That the Seed is the Syſtem or Concentration of the whole Plant, and has Spirit or Ferment enough lodged in it to aſſimilate all that inſipid watry Element (which contributes Matter to its growth) into its own Nature; from hence the great quantities of Eſſential Oyls are produced. It's true, out of the Trunks, and Roots, and Parts of Trees we have Eſſential Oyls extracted, but with a vaſt diſparity, there being only a very ſmall quantity (in proportion to what is in the Seeds) floating up and down the other parts of the Vegetable.

But I am not only to take notice of the Potential warmth of the Vegetable, there being in my Opinion another Ingredient fit to be obſerved, which our Eſſential Oyls may be proved to contain, and that is a Volatile Salt, which gives much of that pungency to the Taſt. If we conſider the Conſtituent Parts of theſe Active Vegetables, they much abound with Salts, which by a moderate Fire are made Volatile, and by a violent Fire are fixt. This ſeems to me more than probable by what I have found in a quantity of Oyl of Cinamon; having had it in my own keeping for Twenty Years; for about Ten or Twelve Years it continued the ſame, but within theſe ſix later Years it has Annually let fall ſome Salt, inſomuch that it is now one half of it turned to Salt, and this without any addition or any Art uſed to reduce it to this form.

There is alſo ſeparated in Diſtillation of great quantities of Vegetables, as of Thyme, Organ, Penny-royal, &c. a Volatile Salt of a peculiar Nature (which our Excellent Chymiſt, Mr. *Molt*, firſt ſhewed me, and keeps quantities of it by him) this is very clear, or Cryſtalline, in its Specifick Gravity a ſmall matter heavier than Water, and ſeems to be Salt and Oyl coagulated into a Body: It will not diſſolve in Water, but eaſily evaporates when heated. I now conſider theſe Salts as Alkalies,

which

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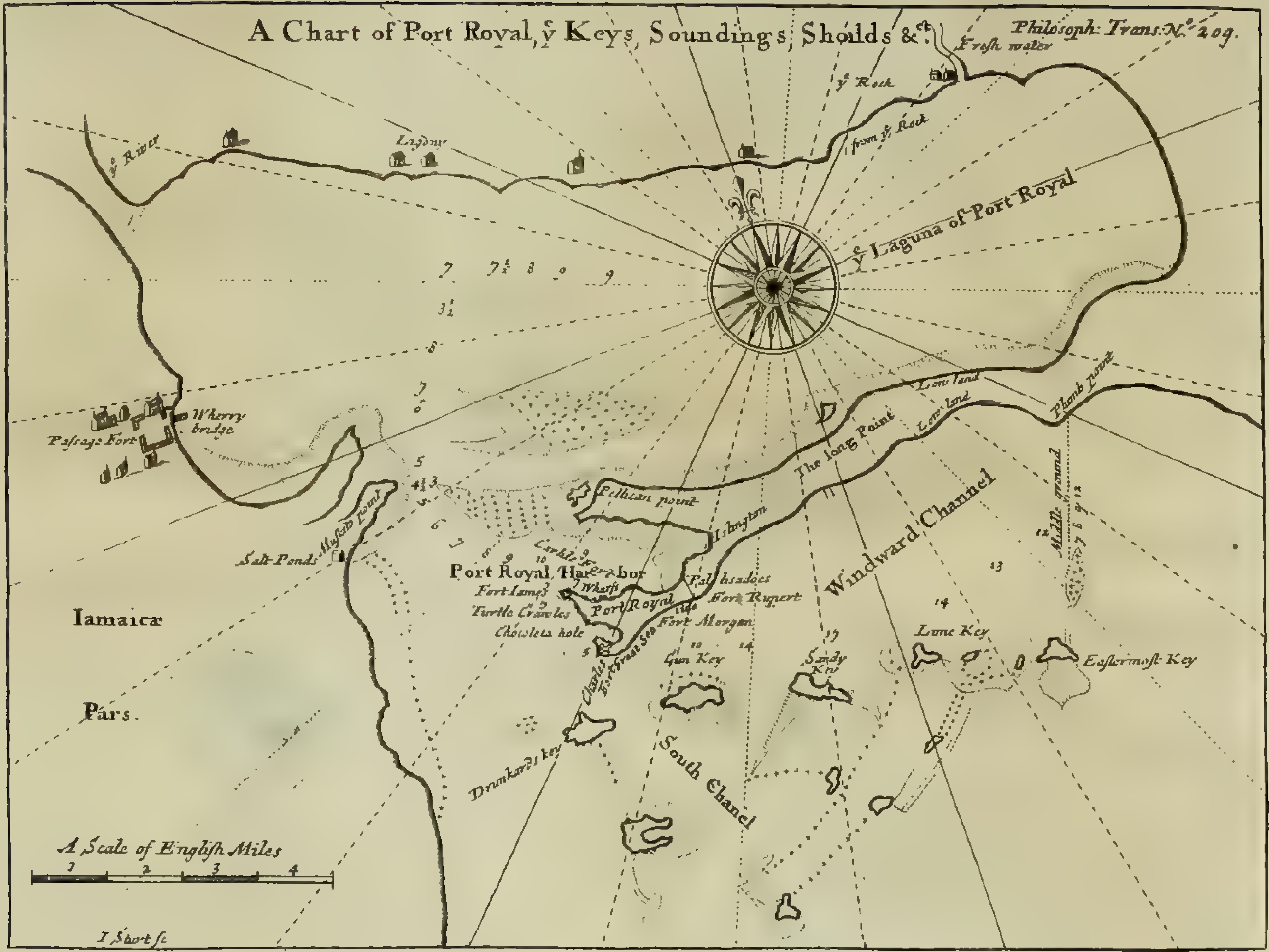

A Chart of Port Royal, ye Keys, Soundings, Shoalds &c.

Philosoph: Trans: No 209.

which all true Volatile Salts are, they do preſently Ferment and make great Colliſion with Acids, and therefore am much inclined to make this Inference, That our Oyl is not a bare *Pabulum ignis*, or an unactive Principle, but does upon a double account as well upon the ſcore of the incaleſcent Oyl as of the inherent Salt conſpire with the Compound Spirit to make this great Heat, Exploſion, and Accenſion.

In the Catalogue of Experiments,

We may further obſerve, That of the light Eſſential Oyls drawn from Seeds of Vegetables, all of them do make a great Ebullition with an Exploſion, but that few of them do actually take Fire: And that all of thoſe that are drawn from Trunks or other Parts of our Vegetables, do certainly take Fire and Flame. Wherefore having obſerved that theſe that do not take Fire or Flame, did yet make as great an Exploſion and Ebullition, and probably as great a Heat as thoſe that did, I was apt to impute it to the Lightneſs and too great Subtilty and Volatility of thoſe Eſſential Oyls, whoſe very active Particles did too ſoon exhale or fly away. And this Conjecture is ſomething juſtified by the Addition of a more Ramous Body, (which was Balſam of Sulphur made with Oyl of Turpentine) to our moſt Volatile or Subtile Oyls, which then produced a Flame, whoſe Particles being more Craſs or Ramous, will detain the more Volatile Oyl from too ſoon an Exploſion, and give more time to the fiery Spirit to penetrate, and mix it ſelf with thoſe Combuſtible Materials. And this may be one Reaſon why the Ponderous Oyls diſtilled from the Roots or Ligneous parts of a Plant do all take Fire, namely, becauſe the parts of this ſort of Oyl lying cloſer together, do not ſo ſoon diſſipate after the Spirit is caſt upon it. And then to the Specifick Gravity the difference is alſo very conſiderable, which any one may find by this familiar way: If you fill a Glaſs with one Ounce of the Eſſential Oyl of the Seeds, you will require Nine Drams of the Ponderous Oyl of the Vegetable to fill up the ſame ſpace.

This is alſo very obvious to any Spectator, that moſt of theſe Oyls thus diſtilled are more Ponderous than common Water, by their ſinking to the bottom; whereas all our Eſſential Oyls drawn from the ſeedy parts, do ſwim on Water, and ſome are lighter than the beſt rectified Spirit of Wine, but moſt are lighter than Brandy, which has made our Chymiſts call them Ætherial Oyls.

In the Catalogue of Experiments you may find which are the Ponderous Oyls, that do conſtantly take fire. Moreover the Ponderous Oyls have yet one Advantage above the lighter Volatile Oyls, they having been expoſed to a longer and ſtronger degree of Fire than the others, and ſo do incorporate more Igneous Particles with it ſelf, which being put into motion, may contribute ſomething to cauſe this Accenſion.

The Oyls diſtilled from Animal Bodies do all of them take Fire and Flame, but with this difference, they do not make ſo great an Exploſion as the Vegetable do, but do more certainly take fire, and will continue their flame longer, but not ſo fierce as the other. If we rightly Examine the Conſtitution or Texture of this Oyl, we have ſeveral Properties adapted to the Production of this Effect. You have a much greater degree of Fire required in the Diſtillation of this Oyl than is neceſſary for that of the Vegetable. You have alſo a great quantity of Volatile Salts (which are true *Alkalies*) that do paſs over with your Oyl: And you have a Ponderous Oyl, that ſinks in Water; which being conſidered and weighed together, do make it equitable rable to expect a more conſtant Accenſion from the Animal Oyls than from any other.

Oleum Succini is juſtly put in the Catalogue of Minerals, and is produced by a ſtrong degree of Fire (as is above mentioned) does yet not make any Motion, and ſcarce any Incaleſcence with this Oyl, notwithſtanding its abounding with Volatile Salts: The reaſon is, becauſe theſe Salts are not properly Volatile, as *Alkalies* are, but do belong to the Family of Acids, and ſo can make no Ferment with this Compound Spirit, which is it ſelf highly Acid.

Having now made it plain and eaſie for any one to make two Liquors, actually cold, without any adventitious heat or fire, boyl up to a Flame, it will ſeem ſtrange that after ſo many Experiments made in the World by all ſorts of Chymiſts, and with all manner of Fermenting and Fiery Ingredients, none ſhould have diſcovered a certain way of producing this great and deſirable Effect. For though I will not queſtion the veracity of the great *Borichius*, who declares to the World, that he made his Oyl of Turpentine and Spirit of Nitre to take Fire and Flame; yet for my part, after ſo many unſucceſsful Experiments made with the greateſt Accuracy I could, I muſt ſtill own my incapacity to perform it: But if you add ſome drops of Balſam of Sulphur to that Oyl of Turpentine, the Effect will then very certainly ſucceed, and your Mixture advance to an actual Flame. However it may prove as to this laſt mentioned Mixture, the great variety of other Liquids that are made to kindle and produce flames, will now put the Matter of Fact out of Queſtion, which I am told has been by many Experimentors doubted of.

A Strange Experiment of Exploſion and Accenſion made in Vacuo.

I Shall venture here to add one ſurprizing Effect of this Fiery Mixture, which was done in the Preſence of ſeveral Spectators.

We took half a Dram of the Oyl of Carui-Seeds, and poured it into a little Gally-Pot, and put a Dram of our Compound Spirit of Nitre in a ſmall Vial into the ſame Gally-Pot, and placed over it a Glaſs that held Three Pints upon Monſieur *Papin*'s Exhauſting Engine, and having ſoon cleared it of the Air, we turned up the Vial in Order to ſee what Effect would enſue, in this ſort of *Vacuum*, upon this Mixture: But in the twinkling of an Eye the Receiver was blown up, and the Mixture in a flame, which ſtupendious *Phænomenon* ſurprized and frightned us all. Nor did I ever ſee or hear of the like by any Mixtures made in *Vacuo*, though I have my ſelf ſeen a Thouſand. For if we look into thoſe many and Admirable Experiments made by the Immortal Mr. *Boyle*, the removal of the Air did almoſt always extinguiſh Light, and Fire, and Flame.

The blowing up of the Glaſs does alſo make the Experiment the more aſtoniſhing, and puzzles one how to Account for ſo great a quantity of Air as was produced from theſe Liquors, which amounted only to a Dram and half; for here was required not only Air enough to fill up the capacity of the Veſſel, but alſo there was required ſo great a preſſure within as did exceed that great incumbent weight of the Air that preſſed upon this capacious Glaſs without, (whoſe Diameter was Six Inches, and the depth above Eight) for otherwiſe it would not have thrown it up into the Air.

If we review and conſider well the *Phænomena* of this Experiment, we may find the reſiſtance of ſome Hundred weight that was countervailed; and not only ſo, but with a much greater force exploded.

That it was not produced by any Expanſion of the Common Air, for that was ſeen to riſe out of the Liquors themſelves, and was drawn out of them in their ſeparate ſtate by the Exhauſting Engine, which ſuffers no Elaſtical Air to lye concealed in any Liquors.

That it was produced in an inſtant by the mutual Colliſion and Agitation of theſe Active and Self-Expanding Liquors.

That it was not abſolutely generated, *de Novo,* but that the Air was antecedently there, we may reaſonably believe, although in a very differing ſtate from what it is in, when in *Pleno.* For all that the Exhauſting Engine does is to deliver the Air from a ſtate of Compreſſion, by leaving it to ſtretch it ſelf like a Bladder, that has full liberty to ſwell up, and has no hard Body to ſtreighten or oppoſe its Expanſion: So that we have cauſe to conclude our Liquors to be furniſhed with this ſort of Air, which, being by the Accenſion of theſe two Liquors put to a new and violent motion, do expand themſelves, *de Novo*, and to that degree, as to anſwer ſo great an Effect as is above-mentioned.

The Circumſtances of which *Phænomenon* will allow me to call this Mixture a ſort of Liquid Gun powder, which brings me to make

A Compariſon with Gun-powder and the Fiery Mixture.

Theſe *Phænomena* agree, in that both do heat, and burn, and flame; and alſo do conſiderably reſiſt and raiſe up Bodies that do oppoſe them: In both, the Air is much agitated and expanded. For in Gun-powder you have much Air coil'd up and included in Particles of Nitre, which the Brimſtone and Charcoal by their ſudden Accenſion do violently expand and ſwell to that degree, that like a ſtorm of Wind it bears very heavy and reſiſting Bodies before it, eſpecially when it it compreſſed or reſtrained within juſt Bounds.

The Experiment juſt above mentioned can only account for that Exploſion by charging it to ſome little concealed Air our Fiery Mixture expanded; in ſo much that I doubt not that if a way were invented (which ſeems to me not impracticable) to make it go off as Powder does out of a Gun, it would project a heavy Body a great way.

We further made an Experiment in *Pleno*, or after this manner:

We put a ſmall quantity of the Oyl in a Gally-Pot, and ſome of the Spirit in an open Glaſs, and fixed a Plate of Copper upon the Gally-Pot, ſo as to cover it pretty exactly, and then ſet a Weight upon the Plate, and pulling a ſtring, made the Spirit to mix with the Oyl, which did at that inſtant blow up the Cover, and throw off the Weight.

But though it doth in ſome reſpects agree with Gun-powder, yet in others you ſee a great diſparity: For Gun-powder will not be made to take Fire, or make any Exploſion in *Vacuo*, both which this Mixture performed with the ſame Celerity it did in the Air.

Gun-powder is a Compoſition of the moſt dry and Combuſtible Materials we can pack together; in our mixture of two Fluids, one of them is not eaſily made to burn by it ſelf, and the other will exſtinguiſh Common Fire.

Gun-powder requires actual fire to bring it to an Accenſion, whereas in this you have only two Waters or Liquors, both cold to the Touch, that do produce Fire and Flame by the bare joyning and mixing them together.

And now we will conclude this Experiment, only taking notice of the *Caput Mortuum*, (as Chymiſts call it) or of what remains after the Accenſion is over, which ſeems to be ſomething uncommon.

In caſe you have adjuſted the Proportion of Spirit to the Oyls exactly well, yon will not fail to make the Mixture flame: And upon the extinction of the flame you will have a light and blackiſh Subſtance, which will indeed vary both as to the Bulk and Complexion, according to the difference of the Oyls. But in this they all agree, namely, to leave behind a ſpungy and exceeding light Matter, and perfectly inſipid. Sometimes it ſwells up into a great Protuberance, as big as a Man's fiſt above the Gally-Pot; and if you taſt it (which you may ſafely do) and macerate it in your Mouth, you will find it to be as taſtleſs as Paper, or even Paper when burnt to Aſhes. In ſo much that we may ſafely conclude that by this Powerful Mixture a third Solid Body reſults abſolutely differing from either of the two mentioned Liquors: And which makes it the more Remarkable, that both of theſe Fluids, which have ſo great an impreſſion upon the Organs of Smell, and a very great one on the Organs of Taſt, ſhould in an inſtant be deſtroyed, and terminate in a dry inſipid *Caput Mortuum*, which will not melt in the Air, nor be diſſolved by Water, nor other Corroſive *Menſtruums*, but remains as much a *Caput Mortuum*, as a piece of Paper, or a Rag burnt to Aſhes, if not much more.

Upon a review of the whole, this Experiment will poſſibly not only ſurprize and amuſe ſome, but pleaſe and delight others; and not only ſo, but perhaps afford ſome Inſtruction to a Philoſophical Genius. By this the Power of Motion, in order to the producing thoſe great Effects of Heat, Fire, Flame, and Light, may be conſidered; the Natures of Oyls ſomewhat examined and extinguiſhed, the Productions of new Bodies by the

Power of Mixture repreſented, and I hope in time ſome Mechanical uſe made of it, at leaſt its heartily wiſhed ſo.

Since this Paper was almoſt finiſhed, having diſcourſed with Mr. *Molt*, a moſt Ingenious Chymiſt, and deſervedly a Fellow of the *Royal Society* (to whom I muſt acknowledge an Obligation for the liberal uſe he allowed me of his great and Excellent Collection of Eſſential Oyls) about his Obſervations in thoſe Tryals he has made, and particularly about Oyl of Turpentine, whether he did ever make Oyl of Turpentine take fire, which he does affirm that he has performed it; but yet it proves ſo hard a matter to bring it to an Accenſion, that he is always doubtful of the ſucceſs.

I know that if a Candle be brought any thing near the ſmoak, raiſed by this Mixture, then the Oyl will certainly take fire from the flame of the Candle. Not but that I am glad of this or any Opportunity to do Juſtice to the Memory of the Famous *Borichius*, who has Printed an Experiment of this ſort in the *Acta Hafnienſia*.

Mr. *Molt* did alſo inform me, that Spirit of Wine would give a flaſh of Light with this Compound Spirit, but not burn; and he has obſerved the ſame Circumſtance in his Experiment (which I did formerly in the Year 1683.) That if you put your Spirit of Wine to the Nitre, you will have a great Effervеſcence immediately enſue; but if you invert the order, and put the Spirit of Nitre on the Spirit of Wine, you will not have any Ebullition for ſome time: But this Circumſtance is quite contrary to all the other Experiments we have made about the Oyls.

See Tranſ. N°. 150. pag. 293.

That the Spirit of Wine does not take fire, ſeems to proceed from the ſame Impediment which hinders light Oyls from coming up to an Accenſion, becauſe they are ſo ſuddenly thrown off; and there ſeems to be a great

Analogy betwixt Ætherial Oyls and the Spirit of Wine, both as to Specifick Gravity, and as to other Properties, Spirit of Wine ſeems to be a more thin and diluted Eſſential Oyl, that contains ſome Water and more Air in its Pores, they ſeem to own the ſame materal Cauſe; for if you Diſtil an Eſſential Oyl out of any Seed, you ſhall not then be able to produce any Spirit, and *Vice verſa*, if you Diſtil off the Spirit firſt, no Oyl will follow. There is alſo a great affinity in Texture, for the Spirit and Oyl do eaſily unite and mix together, eſpecially if the Spirit be highly rectified, and have leſs of Water or other heterogeneous Matter in it; as any one may find if he will take the pains to ſhake a true Eſſential Oyl with Spirit of Wine, a good proportion of the former will incorporate with the latter.

POST-

POST-SCRIPT.

THE *Pyrites* being the Mother of our Oyl of Vitriol, which is the principal Ingredient in our Active Fiery Meteor or Compound Spirit; I will here ſet down an Account I received of an honeſt unphiloſophical Friend of mine, who complained of his great Loſs, which he attributed as a Puniſhment of his Covetouſneſs. He was Maſter of a Copperas Work at *Whitſtable* in *Kent*, and engroſſed all the *Pyrites* or Copperas-ſtone to himſelf, in order to the breaking of a Neighbours Work, in ſo much that he had laid up two or three Hundred Tun in a heap, and built a Shed over it to keep off the Rain: But in the ſpace of ſix or ſeven Months it firſt ſmoaked, and then took fire, and burnt for a Week; it burnt down the Shed, ſome of it look'd like melted Metal, and other parts like red-hot Stones, but diſcharged ſo fætid, Sulphurous, or ſtinking Exhalations, that the People in the Neighbourhood were miſerably afflicted, and forced to uſe all their endeavours to extinguiſh it.

How far this Communication will ſerve the Hypotheſes of thoſe that derive Lightning, and Thunder, and Earthquakes from the Matter of the *Pyrites*, or will Account for the Riſe or Continuance of burning *Vulcans*, or even the Great Conflagration of the World, I leave to their Conſideration.

III. *A Letter from the Reverend Mr.* Thomas Dent, *to Sir* Edmund King, *Kt. M. D. & S. R. S. Concerning a ſort of Worms found in the Tongue, and other Parts of the Body*, &c.

Leiceſter, July 2d. 1694.

SIR,

I Hope you will Pardon the Trouble of this, becauſe it will in a great meaſure ſatisfie you about that Diſtemper upon my Tongue, for which I have ſo lately had your Advice: The Obſervation is very Curious, and (I believe) not ordinary in the way of your Practice, if I tell you, that the chief cauſe of thoſe riſing Tumors fix'd upon my Tongue, proceeds from the Diſeaſe of Worms, concerning which I ſhall give you this following Account. In Reading Monſieur *De la Croſs*'s Memoirs for the Ingenious, in the Month of *July*, 1693. Letter the 30*th*. Dedicated to the Honourable Mr. *Joſeph Ralphſon*, I found an Obſervation, which he has publiſhed to the World, concerning the Cure of this Diſeaſe of Worms by one *Sarah Haſtings*, who was very Famous in the Diſcovery of them in the Face, Gums, Tongue; and which ſhe managed with ſuch dextrous Art in the Operation, that ſhe took them out of any Part affected with a Gooſe-Quill. I refer you to Mr. *De la Croß* in the forementіon'd place, concerning the Hiſtory of her Cures; one of which being in ſome reſpects like to my caſe, I was the more Curious and ſollicitous to enquire out, if there were any of the Worm Doctreſſes now in being; and hearing of one Famous at *Leiceſter*, I was reſolved to write to her, deſcribing all the Symptoms as plain as I could explain them; to which I had a return, that ſhe believed my Diſeaſe to be Worms; and being reſolved to try the Experiment, I took Coach for *Leiceſter*, where being come, my Doctreſs (Mrs. *French* by Name) no ſooner inſpected the Place, but inſtantly declared her Opinion, that the Diſtemper proceeded from Worms. The next day ſhe fell upon her Operation, which was performed in the Preſence of two Aldermen of the Town, Mr. *Gibbs*, my Lord of *Derby*'s Chaplain, and ſeveral others, when piercing the Part affected with a Lancet, ſhe drew ſome Blood, and ſoon after with a ſmall Spatula, and another Inſtrument with which ſhe opened the Orifices, ſhe pick'd out five or ſix Worms at a time, ſome of which I have here ſent to you for your more Curious Obſervation. She plainly ſhewed them to the Spectators as they came out of the Fleſh; they were all alive, and moved their Heads, ſomewhat leſſer than Ordinary Maggots. I can tell you, that in leſs than Eight days ſhe took out of my Tongue more than an Hundred Worms, all almoſt of the ſame bigneſs, except two very large ones, which (ſhe told me) were of a Cankerous Production: She took more than Thirty out of my Gums, which laſt Operation is her ordinary or daily Practice; Perſons of good Note reſorting to her from all Parts of the Country thereabouts. I was very Curious to Enquire out what Cures ſhe had done of this Nature; and I found a very Satisfactory Account from Perſons of ſome Quality and Note: And to be ſhort, though the Operation was very ſurprizing, and ſo will (I ſuppoſe) ſeem to you Incredible, yet neither I, nor any one preſent could diſcover any Fallacy, but all the plain dealing that Ocular Demonſtration can admit of to prove the reality of the Operation; which I my ſelf ſaw her perform upon ſeveral Patients while I was at *Leiceſter*. I cannot now have time to enter upon a Natural or Philoſophical Reaſoning about the Nature or Production of theſe Animals; I will leave it to your

Ingenious Thoughts, and the Enquiries of your Learned Society at *Greſham*. I and many others are ready to atteſt the Truth of what I write, nor would I willingly obtrude an Error upon the World. The Cures the Woman performs in picking out theſe Worms from all Putrefactive Ulcers, Tumors, and Sores, whether in the Faces, Noſes, Gums, or Tongues of ſeveral Perſons, prove, that ſuch Animals are generated in thoſe Parts. I have received ſome ſenſible good, and hope to have more Relief by her next Operation; and I do judge it very fit, that her dextrous Art ſhould be more curiouſly enquired into, that it may not be loſt, for the benefit of Mankind; I have wrote this more at large, becauſe I know you are ingeniouſly Curious in ſuch Matters. You or any others who are Incredulous, may have more full Satisfaction from Mr. *Newton*, a worthy Miniſter of the Town; and Mr. *Goodall*, and Mr. *Ludlow*, who are two of the chief Aldermen of the Town: And (I ſuppoſe) for a ſmall Advantage my Doctreſs will be reedy to perform her Operation, if called to *London*; which will be proper for the further Satisfaction of the Ingenious, in the Number of which you will give me leave to continue your Admirer, as I am with all Reſpect,

SIR,

Your moſt Humble and

Obliged Servant,

THO. DENT.

IV. *The Extract of a Letter from* Mr. Mark Lewis, *confirming the ſame Operation on other Perſons.*

SHE put the Caſe beyond all diſpute; (1.) By ſhewing me the Head of the Worm in the Orifice before ſhe extracted it. (2.) He was ſtill ſenſible of their approach before ſhe could ſee them. (3.) She deſigned, what he intended to have done, that an Inciſion ſhall when he comes to Town, be made in the place, that if Worms be not then found, ſhe may then be well ſpoken of.

To me ſhe gave a Catalogue of ſeveral Cures ſhe had done in the Town and Country, one was my own Relation, I know to be a truth.

Thus far we went over-night, ſhe took Fifteen or Sixteen Worms out next Morning. I found Mr. *Newton* deſirous to ſee the Operation, he was a Stranger to us both; but we complyed with his deſire, were extream glad of his Company when he told us it was on your Account.

He took the ſame Care I had done, ſaw the ſame Effects I had done over-night, only now there were not above Ten Worms; they came by two at a time, once as I remember three.

I deſigned to have ſent you ſome to compare with yours; told her of the Fraud my Friend, Mr. *Popple*, had detected in the *Stamford* Woman.

I had provided ſome ſoft Cotton in a ſmall Box, but why, I know not, they now all dyed the ſame day before I was got home, when as formerly I had kept them Fourteen or Fifteen days; they had faſted three days before I had them.

I had the Curioſity to try whether I could find any Blood in them, but did not; which makes me think they feed of the ſame Humour they are bred of.

V. *Part of a Letter from Mr.* Edw. Lhwyd, *to Dr.* Liſter; *giving ſome farther Account of the Fiery Exhalation in* Merionydh-ſhire.

Honoured Sir,

I Diſcourſed with an Intelligent Sober Perſon, that lives near *Harlech* in *Merionydh-ſhire*, who aſſured me the Fire ſtill continues there; that it is obſerved to come from a place called *Morva bychan* in *Caernarvon-ſhire*, about Eight or Nine Miles off, [over part of the Sea.] That Cattle of all ſorts, as Sheep, Goats, Hogs, Cows, and Horſes, ſtill dye apace; and that for certain, any great Noiſe, as Winding of Horns, Drums, &c. does repel it from any Houſe, or Barn, or Stacks of Hay; upon account of which Remedy, they have had few or no Loſſes in that kind ſince *Chriſtmas*. That it happened during this Summer, at leaſt one Night in a Week, and that commonly either *Saturday* or *Sunday*; but that now of late it appears ſomething oftner. The place whence it proceeds is both Sandy and Marſhy. This is all I could gather from him, material.

See *Philoſ. Tranſact.* N°. 208. This Letter was dated, *Oxf. Aug.* 23. 1694.

VI. *The*

VI. *The Extract of another Letter from Mr.* Anthony Van Leuwenhock, *to the* Royal Society; *Concerning the difference of Timber growing in different Countries, and felled at different Seaſons of the Year.*

1. AS to the difference of Timber felled in Winter from that felled in the Summer, the common Opinion is, that the former is the ſtronger, and more laſting, as being more cloſe and firm; but his own Sentiment is, that there is no difference, except in the Bark and outermoſt Ring of the Wood, which in the Summer are ſofter, and ſo more eaſily pierced by the Worm. Wood conſiſting of hollow Pipes, which in Summer and Winter both are full of Moiſture, they do not ſhrink in the Winter, and therefore the Wood cannot be cloſer at one time than another, for otherwiſe it would be full of cracks and clefts. The ſudden and unexpected Rotting of ſome Timber, he conceives to proceed from ſome inward decay in the Tree before it was felled, having obſerved all Trees to begin to decay at firſt in the midſt or Heart of the Tree, though poſſibly the Tree may ſtand and grow for near an Hundred Years afterwards, and increaſe in bigneſs all along.

2. He ſays, he was once of Opinion, That Trees growing in good Ground, but increaſing ſlowly, were the beſt and ſtrongeſt Timber; and that thoſe Trees which in few Years grew large, was the ſofteſt and brittleſt; the contrary to which upon Enquiry of Experienced Workmen he found to be true, and inſtances in an Elm of Eighty Years growth, which was Eleven Foot in Circumference, and proved excellent tough Timber.

3. The Age of Trees is to be known by the number of Rings to be ſeen when the Tree is cut a-thwart, in each of which Rings is one Circle of large open Pipes; now the fewer of theſe large Pipes, the ſtronger the Timber is, wherefore by conſequence thoſe Trees that make the largeſt growth in a Year, muſt be the cloſer and ſtronger; and therefore thoſe Trees that grow in warm Countries grow faſteſt, and are the beſt and toughеſt Timber, which he confirms by *Riga* and *Dantzick* Oak, which is of ſlow growth, and proves Spongy and brittle Timber; whereas the contrary is obſervable in *Engliſh* and *French* Oak, which grows faſter, and is excellent Timber.

Fig. † Repreſents a piece of Oak of 12 Years growth cut Horizontally, where from the Centre *A* to *B* is one years growth, *C* two years, *D* three years, and ſo on; in all 2 $\frac{1}{6}$ Inches, ſo that the Tree in 12 years was 4 $\frac{2}{6}$ Inches Diameter. Whereas about *Riga* it would be 30 or 40 Years ere it grow to that bigneſs. Some of theſe Circles are broader than others, particularly the Ninth, the Tree from ſome accidental Cauſe receiving more Nouriſhment, and growing faſter that Year than the former. He ſays, he examined a piece of Aſh growing in *Norway*, and found it grew 44 years before its Semi-diameter was one Inch; whereas Aſh growing about *Delft* has been obſerved to increaſe an Inch yearly for ſeveral years together.

VII. An Account of a Book.

Myotomia Reformata:

OR,

A New Adminiſtration of all the Muſcles of Humane Bodies; whereiu the true Uſes of the Muſcles are explained, the Errors of former Anatomiſts concerning them confuted, and ſeveral Muſcles not hitherto taken notice of deſcribed: To which are ſubjoyned, A Geographical Deſcription of the Bones, and other Anatomical Obſervations. Illuſtrated with Figures after the Life. By William Cowper, *Surgeon.* London: *Printed for* Sam. Smith *and* Benj. Walford, *at the* Prince's Arms *in St.* Paul'*s Churh-Yard.* 1694. *In* Octavo.

THE Author in his Preface, after premiſing ſomething in Vindication of Anatomical Enquiries, proceeds to a ſhort Hiſtory of the Advancements of Muſcular Anatomy in ſeveral Ages; in which he takes notice little or no Improvement has been made therein ſince *Veſalius* and *Falloppius*'s time,and that the greateſt part of latter Writers of Myology have rather increaſed than diminiſhed the Errors, eſpecially thoſe who have written in *Engliſh*. This conſidered, and he having diſcovered divers Muſcles which hitherto had eſcaped the Obſervations of others, induced him to think a Reformation of ſo conſiderable as well as uſeful a part of Anatomy, might be acceptable to the Publick at this time. And to render his particular Enquiries more intelligible; thoſe Muſcles which have not been taken notice of by others, are not only delineated, but thoſe alſo, which are not well expreſt in the Figures of *Veſalius*, *Caſſerius*, and thoſe of *Bidloo*, and others. And to the end the Deſcription of each Muſcle ſhould be the better underſtood, by ſo ſmall a Volume, he has added two Figures of the *Skeleton*; to which references are made in deſcribing the Origine, Progreſs, and Inſertion of each Muſcle.

In the Introduction, an Account is given of the intimate Structure of a Muſcle; where, he obſerves (by the aſſiſtance of a Microſcope) that each ſingle Fleſhy Fibre is much ſmaller than the fineſt Hair; that it's of a Cylindrical Figure, and that it's ſubſtance is compoſed of divers Cells: He ſuppoſes each Cell to be diſtinct, and that it has one Apperture only into the Extremity of the Blood-Veſſel; from which Structure, divers *Phænomena* may be explained, as by often injecting of fair Water into the Arteries of a dead Animal, why the Muſcles are ſooner tumified than other Parts, and why they are excited to act when ſuch Injections are made ſoon after Death; as alſo, why the Muſcles entertain more Blood in them (as appears by their colour) than divers other Parts; as the *Brain*, *Pancreas*, &c. whoſe Number and Magnitude of Blood-Veſſels exceed thoſe of the Muſcles: Hence, he ſuppoſes the Blood, barely as a Fluid, to be an aſſiſtant in the Contraction of a Muſcle, and that it is the *weight* by which its Action is performed; which, he imagines, may happen two manner of ways; either by a Turgeſcence began in the *Parietes* of the Cells in the Fleſhy Fibres, cauſed by the Contents of the Nerves when agitated *ad Imperium Animæ*; or by a Coarctation of the Veins, whereby the refluent Blood is hindred : By either of theſe means the Cells of the Fleſhy Fibres may be diſtended by the Influent Blood ; whereby the length of each Fleſhy Fibre will be leſſened, and the whole Muſcle contracted.

Chap. I. In the Hiſtory of the Muſcles of each Part, he gives an Account of the manner of the Adminiſtration of Diſſection ; here he follows the Order that is commonly practiſed by Anatomiſts, beginning with thoſe of the *Abdomen :* The Erroneous Deſcriptions of thoſe Parts of the *Oblique Deſcending* and *Aſcending Muſcles* lying in the *Ilia* are rectified, and the true Uſe of thoſe parts of *Them* inſerted : In this firſt Chapter he takes notice of an excellent Artifice in Nature in tranſmitting the Spermatick Veſſels through the Inferiour Parts of the laſt named Tranſverſe Muſcles, whereby a *Prolapſus* of the Inteſtines is prevented.

Chap. III. Beſides rectifying the Erroneous Deſcriptions and aſſigned Uſes of the two Pair of Muſcles that are commonly treated of belonging to the *Penis*, he adds the Deſcription and Figure of a third Pair, mentioned by *Aquapendens* ; the like is done in Treating of the Muſcles of the *Anus*.

Chap. V. The Opinion of *Falloppius* in dividing the *Sphincter Ani* into three Muſcles is rejected, and that of *Riolan*, in multiplying its two *Levatores* to the number of ſix : Beſides the Uſe commonly aſcribed to the *Levatores Ani*, he takes notice of another notable one.

Chap. VII. In treating of the Muſcles of the Eye-lids he rejects the Notion of former and ſome latter Anatomiſts, and retains that of *Falloppius*.

Chap. VIII. He conceives the Vulgar Notion concerning the Office of the two Oblique Muſcles of the Eye to be erroneous, and inſerts their true Uſes ; and takes notice of an admirable Mechaniſm in Nature in the diſpoſition of thoſe Muſcles.

Chap. IX & X. In deſcribing the Muſcles of the *Alæ Naſi* and Lips, he takes notice of two pair, which have eſcaped the Obſervations of Anatomiſts: The firſt of which he calls *Conſtructores Alarum Naſi & Depreſſores Labii ſuperioris,* from their Uſe; the other Pair alſo receive their Names from their Office, and are called *Elevatores Labii inferioris proprii.*

Chap. XI & XII. *M. Du Verney*'s Account of the Muſcles of the External Ear, or *Auricula,* is imitated. He reckons four Muſcles belonging to the Internal Ear, of which three are employ'd in the Motion of the *Malleus*; of theſe the firſt is the External Muſcle of *Aquapendens* and *Placentinus*; the ſecond is the External one of *Du Verney,* which from its Poſition our Author calls *Obliquus Auris*; the third is the *Internus Auris,* deſcribed by *Euſtachius*; and the fourth is the *Muſculus Stapedis.*

Chap. XIII. Beſides the Uſes commonly aſcribed to the *Muſculus Mylohyoideus,* he aſſigns another notable one, in Compreſſing its ſubjacent ſublingual Glands, and Salival *Ductuſes.*

Chap. XIV. He reckons but three Pair of Muſcles belonging to the Tongue, (*viz*) *Geniogloſſum, Ceratogloſſum,* and *Styloglоſſum.*

Chap. XVI & XVII. In deſcribing the Muſcles of the *Fauces* and *Gargareon,* he reprehends *Riolan* for pretending to their Invention, ſince they were accurately deſcribed before him by *Falloppius.* Inſtead of thoſe two pair of Muſcles called *Sphænopharyngæum* and *Chephalopharyngæum,* he deſcribes one Muſcle only, and calls it *Pterygopharyngæus*; of which he gives a Figure, together with the reſt of the Muſcles of the *Fauces.*

Chap. XVIII. In demonſtrating the Office of the *Muſculus Digaſtricus* of the Lower-Jaw, he takes notice of an Admirable Artifice in Nature, which renders that Muſcle and its Partner capable of drawing the Lower

Mandible downwards; whereby divers *Phænomena* relating to the motions of the *Os Hyoides* and *Larynx* (particularly in the Action of Deglutition) are explained, and a Cauſe aſſigned, why the Actions of the laſt named Parts are not dependent in ſome Animals.

Chap. XIX. Among the Muſcles of the *Thorax* which appear in the fore-part, he reckons the *Muſculus Scalenus*, which according to the Accurate *Falloppius*, he divides in three Muſcles.

Chap. XXII. Beſides ſeven pair of Muſcles deſcribed by Vulgar Anatomiſts employed in the motions of the Head, and two pair more mentioned by *Galen*, *Oribaſius*, and *Falloppius*, he adds another pair, which he calls *Recti interni minores*.

Chap. XXIII. He has diſcovered divers ſmall Muſcles lying between the double Spines of the *Vertebræ* of the Neck, which he calls *Interſpinales Colli*.

Chap. XXIV. After the Deſcriptions of the Muſcles inſervient to the motions of the Head, Neck, Back, and Loyns, he obſerves that the extending Muſcles of thoſe Parts are more numerous and ſtronger, which he thinks for ſeveral ends to be a Provident Contrivance in Nature.

Chap. XXVI. He deſcribes the Bicipital Muſcle of the *Cubit* to have a double tendinous Termination, the external of which, he calls *Faſcia Tendinoſa*, it including all the external Muſcles of the *Carpus* and Fingers; to which Tendinous Expanſion he aſſigns ſome Remarkable Uſes: Here he gives an Account of an Extraordinary Caſe in Practice relating to this Bicipital Muſcle.

Chap. XXVIII. He aſſigns a notable Uſe to that ſtupendious Contrivance in Nature, in conveying the Tendons of the Inferiour Muſcle bending the Fingers, called *Profundus*, through thoſe of the Superiour or *Sublimis*. He conceives the Lumbrical Muſcles (which lye in the

Palm of the Hand) perform thoſe minute motions of the Fingers in playing on Muſical Inſtruments, when their ſecond and third Bones are bended.

Chap. XXXII. He Obſerves that no Muſcle is properly employed in Rotating the Thigh-Bones inwardly, but that the fore-parts of the *Glutæi medii* and *minimi* Officiate in that Action.

As to divers other Particulars relating either to the Deſcriptions, Uſes, and Reaſon of the differing Conſtitutions of divers Muſcles, with their manifold Conſtructures, we muſt refer to the Book it ſelf, leſt we exceed the limits of this Account.

At the end of the Deſcriptions of the Muſcles, he adds an Appendix, containing an Account of the intimate Structure of the *Penis*, and the manner of its Erection: After taking notice of divers things Remarkable in its Common Integuments, he deſcribes the Lymphe-ducts of the *Penis*; which he had firſt an Opportunity of Obſerving by injecting *Mercury* into the Blood-Veſſels of that Part. Theſe Lymphe-ducts (like thoſe of the Inferiour Parts) he ſuppoſes do diſcharge their Contents into the Ingrinal Glands; whence an Account may be given, how thoſe Glands become diſeaſed and tumified in Venereal Caſes.

In the next place he gives an Account of certain Glandules not long ſince taken notice of by that Accurate Anatomiſt, Dr. *Tyſon*; by him called *Glandulæ Odoriferæ.* After ſome intimations in relation to this Part's being deſtitute of fat, he takes notice of a Ligament, which from its Office he calls *Suſpenſorium Penis*; the uſe of which he afterwards mentions in ſpeaking of the Erection of that Part. He deſcribes two ſorts of Veins belonging to the *Penis*; the External of which, he calls *Venæ Præputii*, they ariſing chiefly from the Arteries in the Præpuce: The Internal (which take their riſe from the Arteries of the *Penis* it ſelf) he calls *Venæ ipſius Penis.* From the Structure of the *Penis* it ſelf, and Conformation of its adjacent Parts, and Diſpoſition of its Blood-Veſſels, he gives a Mechanical Account of its Erection.

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PHILOSOPHICAL TRANSACTIONS.

For the Months of November *and* December. 1694.

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I. *Nobiliſſimo & Doctiſſimo Viro* D. Roberto Southwell, *Equiti Aurato Societatis Regiæ Præſidi Digniſſimo, S. D.* David Gregory, *Aſtr. Prof. Savilianus.*

CUM legerem nuper evulgatam ab Abbate Galloys Hiſtoriam eorum quæ juſſu Societatis Regiæ Gallorum Pariſiis anno ſuperiore edita ſpectant ad Mathematicos, viſum eſt, quoniam ita jubes, ad te circa rem illam hæc perſcribere.

Nempe edidit Jacobus Gregorius Anno MDCLXVIII. Patavii librum complectentem Propoſitiones aliquot generales de transformatione Curvarum. Has aſſerit (Anno demum MDCXCIII.) hic Abbas Gregorium, & deinde alias hiſce ſimiles Iſaacum Barrovium Britannos, à Robervallio Gallo, & Societatis Gallorum Philoſophicæ Mathematico, eſſe ſuffuratos.

Cum ederet tractatum ſuum de parte univerſali Geometriæ Gregorius, vivebat Robervallius; vivebat quoque Anno MDCLXXIV, cum lectiones ſuas Geometricas ederet Barrovius: Barroviana quippe illa vidit probavitque Gregorius, eodem vero tempore mortui ſunt Gregorius & Robervallius, menſe ſc. Octobri anni MDCLXXV. Robervallii vero quæ dicuntur anno primum MDCXCIII prodiere. Nulli quæſtus eſt, aut teſtatus unquam Robervallius nota ſibi prius fuiſſe, quæ Britanni iſti plaudentibus Geometris pro ſuis edebant, quamvis famæ ſupra modum fuerit appetens. Teſtem hic appello Nobiliſſimum C. Hugenium, qui mihi, paulo poſt editam hanc Abbatis fabulam, affirmavit Robervallium (cum quo multos annos familiariter vixerat) nunquam propoſitiones Barrovianas aut Gregorianas pro ſuis aut prius ſibi notis vendicaſſe. Accedit quod cum vivente Robervallio lis orta fuerit Hugenium inter & Gregorium, in qua huic ille non pepercit, credibile non ſit voluiſſe Hugenium deeſſe occaſioni objiciendi adverſario compilata Socii Robervallii ſcrinia, aut noluiſſe Robervallium arripere opportunitatem inventa ſua ſibi maturè vendicandi. Edidere ergo ſua Barrovius & Gregorius haudquaquam obſtrepente Robervallio, qui illorum ſcripta tacitus vidit, neque de injuria quæſtus eſt tam atroci ille, qui de minima ſolebat quæri; quippe hic nulla ei fuerat facta. Nemo ſane dubitat quin Britannorum ſcripta viderit Gallus, quæ Mathematici omnes tum legebant: At Galli ſcripta vidiſſe Britannos (quæ mortuis ipſis primum prodeunt) quis pro certo adfirmet.

At potuit (ſi ſit habenda fides Abbati) Epiſtolam Robervallii de tranſmutatione Curvarum Torricellio tranſmiſſam vidiſſe in Italia Gregorius (Italiam quoque adiit Barrovius.) Nam ſcripſit ad Torricellium Robervallius, quæ Gallis nolebat oſtendere impertitus Italo quem eadem Epiſtola Plagii acriter inſimulavit. Torricellius ea non potuit non impertiri Italis ſuis. Itali vero non potuere illa inventa publici juris facere, neque tamen ſe continere quin Britannis diu poſt mortem Torricellii in Italiam venientibus oſtenderent, permitterentque ab ipſis evulgari. Somniat hic Abbas relapſos nos eſſe ad ævum illud fabuloſum quo Monachis poteſtas erat quidlibet audendi & fingendi. Quis enim hodie credat Jacobum Gregorium hominem in Italia peregrinum potuiſſe in ipſa Italia impune venditare inventa illa quæ ante paucos dies ab Italis hauſiſſet? Miraculo proximum foret ſi ille vigeſimo anno poſt mortem Torricellii in Italiam veniens, hujus ſcripta ſimulque nota Italis

Robervallii inventa inſciis aut tacentibus omnibus & Italis & Gallis,ipſo etiam tacente Robervallio, compilaſſet & pro ſuis plaudente orbe Mathematico edidiſſet. Sed hæc Italis & Gallis, priuſquam à Barrovio & Gregorio ederentur, ignota fuiſſe,ſatis probat altum de univerſalibus iſtis propoſitionibus ſilentium. Ut verbis utar Carteſii, ſi iſta tum cognoviſſent, non conſcripſiſſent tanta & talia de rebus Geometricis Volumnia. Verum non fuerint auſi forſan Itali inventa illa à Robervallio & Torricellio per manus tradita in lucem edere, Itali quippe ut fama eſt traditiones omnes non audent edere; Atqui poſtquam illa ſunt edita, quid vetabat quominus ab Italis plagii reus ageretur Gregorius? Aut quo minus ſua ſibi aſſereret Robervallius? Nempe nondum inventus erat hic Abbas qui mortuo Robervallio ea adſcriberet quæ bonus ille vir ſibi vivo non arrogabat. Denique quid potuit obſtare quo minus rapaciſſimus ille Gregorius, ea quæ Barroviana meritò nunc audiunt, pro ſuis ederet, cum prior ſcriberet, & Robervalliana edoctus eſſet ab Italis,eadem illa nempe quæ Barrovium poſtea edidiſſe aſſerit hic Abbas? Aut potius quid obſtabat quo minus ipſe Robervallius illa ederet illuſtria Theoremata quæ reliqua fecerat Gregorius, qui Robervallium docuerat quam nihil fidendum eſſet Geometris ſoli Britanni?

Sed ipſe,ſi credere fas eſt, Gregorius in Præfatione libri ſui fatetur ſurrepta eſſe ab aliis quæ illic exſtarent. Somniat rurſus Abbas noſter. Quis enim, niſi per ſomnium, idcirco putaverit Gregorium fateri nihil in illo libro eſſe ſuum, quia in Præfatione ſcripſerat permittere ſe lectori judicandum quid ibi ſuum (Gregorii) ſit, quid alienum? Profecto judice Gregorio quædam erant illic ſua. Quæ illic ab Archimede, aliiſque quorum ſcripta tum publice proſtabant non repetuntur, ea judice Gregorio nova atque Gregoriana ſunt prorſus: Præſertim cum dicat ſe quidem apud alios methodi ſuæ veſtigia legiſſe,ſed male aut particulariter demonſtrata. Methodus ergo exhibendi demonſtrationes univerſales circa lineas curvas, hoc eſt pars univerſalis Geometriæ, judice Gregorio Gregoriana & Barroviana eſt. Hæc ſane non intellexit noſter Abbas, ut neque partem univerſalem artis condendi fabulas; alioquin non fuiſſet contentus oſtendere Robervallio olim nota fuiſſe Barrovii Gregoriive quæ dicuntur inventa: facile enim ſuerat eadem opera oſtendiſſe Italos & Græcos Geometriam didiciſſe à Gallis qui Romam vaſtarunt,Archimedem Siculum potuiſſe Gallorum inventa ab Italis haurire eodem modo, quo Gallica poſtea didicit ab iiſdem Gregorius aut Barrovius Britannus. Et patet eundem fabulæ morem cæteros priſci temporis Geometras complecti. Veniet quoque tempus quo Abbas hic demonſtrabit nota Robervallio fuiſſe illa quæ hodie in Nevtono admiramur. Obſtat nunc (proh dolor) nondum intellectus Abbati, iiſque qui cum Abbate faciunt, Neutoni liber. Evidens igitur eſt deſcriptas fuiſſe per Robervallium ex Barrovii

Gregoriive libris Propoſitiones, quas memorat Abbas; ſi modo eas ſcripto commiſerit Robervallius: Cum hic illorum libros viderit, illi hujus ſcripta legerint nunquam.

Sed Abbatis fabulam tantiſper veram eſſe jubeamus. Eſto quod Epiſtolam hanc nunc primum viſam Torricellio inſcripſerit Robervallius. " Ergo (inquit Abbas) Methodus transformandi figuras ibi reperta eadem eſt, ſi penitius excutiatur, cum exhibita à Gregorio primum in " Geometria ſua Univerſali, poſtea à Barrovio in Lect. Geom. horumque Propoſitiones eædem ſunt cum concluſionibus Robervallii; earundem quippe figurarum & conſtructionum ope demonſtratæ. Ecquis jam dubitet, Barroviana & Gregoriana omnia aut longe plurima in Robervallianis hiſce contineri? Dicam quod res eſt. Propoſitio quæ Gregorio in Geom. Univerſ. eſt XI, & Barrovio in Lect. XI eſt X, eadem eſt cum Propoſitione Robervalli de figurarum transformatione. Hanc & quidem unicam (demonſtratione miſera & pudenda veſtitam) videre eſt inter Gallorum opera varia in fine tractatus de indiviſibilibus *pag.* 241, & rurſus *pag.* 295 in Epiſtola illa Torricellio inſcripta. Quam ſibi nihil laudis periiſſe eo ſive Robervallii invento ſive Abbatis Commento Judicarent Noſtri? Quamque ſibi plauderent nunc tam ſecuris de tot aliis inventis & Pyraticæ licentiæ poſthac annuente hoc Abbate, non objiciendis?

Non pigebat tamen adnotaſſe quam diſſimiles rationes ſecuti ſint in cauſa non diſſimili Galloys hic & Walliſius. Adfirmat Walliſius multa eſſe in libro Carteſii de Geometria ex Harrioto tranſlata. Quippe oſtendit eſſe utrique communia, & quæ in nullo alio reperiantur. Notum eſt quoque librum Harrioti editum fuiſſe Londini Anno MDCXXXI, auctore tum mortuo; & Londini, eo Anno fuiſſe Carteſium natum annos 37. edidiſſe demum Geometrica illa Carteſium anno MDCXXXVII. Manifeſtum tum videtur potuiſſe Carteſium quædam tranſtuliſſe ex Harrioto, & non potuiſſe Harriotum ſua tranſtuliſſe ex Carteſio. At hiſce contraria adfirmare non dubitaverit hic Abbas. Gregorius enim Barroviuſque ſcripta ſua edidere & diem ſuum obiere ante edita Robervallii iſta, qui illorum ſcripta viderat, nec moverat de iis litem. Ergo, ſi qua fides habenda ſit Abbati, culpa ipſius Carteſii factum eſt quo minus credamus Harriotum ſua ex Carteſio tranſtuliſſe. Debuiſſet enim librum ſuum dum viveret non edidiſſe Carteſius. Si librum illum nondum editum & apud ſe deliteſcentem ſervaret Galloys, heu quantum bellum inſtaret Walliſio. Vale vir Nobiliſſime & veritatem tueri perge.

Dabam Oxoniæ, 15 *Novembris, An.* MDCXCIV.

II. *Monſieur* Caſſini *his New and Exact Tables for the* Eclipſes *of the Firſt* Satellite *of* Jupiter, *reduced to the* Julian *Stile, and Meridian of* London.

AMong the Books the *Royal Academy* of *Sciences* at *Paris* has lately gratified the World withal, there is one which has for Title, *Recueuil d' Obſervations faites en pluſieurs Voiages pour parfectionner l' Aſtronomie & la Geographie, Avec divers traitez Aſtronomiques.* In which thoſe *Sçavans* have ſet a very commendable Example in aſcertaining by undoubted Obſervations the true *Geographical Site* of all the Principal Ports of *France*, which it were to be wiſhed other Nations would imitate. By this Survey they have demonſtrated the Encroachments their *Geographers*, and particularly *Sanſon*, had made on the *Sea* to enlarge their *Kingdom*, and have retrenched more of their Uſurpations on the *Weſt*, *South*, and *North*, than all their *Acquiſts* on the *Eaſt* amount to twice told.

The Method they have uſed to determine the *Longitudes* of their Places, is by the Obſervation of the *Eclipſes* of the *Firſt Satellite* of *Jupiter*, which they find almoſt inſtantaneous, and with good Teleſcopes diſcernable almoſt to the very Oppoſition of *Jupiter* to the *Sun*: And it may be ſaid, that this Account of the *Longitudes* obſerved, has put it paſt doubt that this is the very beſt way, could portable Teleſcopes ſuffice for the Work. And could theſe *Satellites* be obſerved at *Sea*,a *Ship* at *Sea* might be enabled to find the Meridian ſhe was in, by help of the Tables Monſieur *Caſſini* has given us in this Volume, diſcovering with very great exactneſs the ſaid *Eclipſes*, beyond what we can yet hope to do by the *Moon*, tho' ſhe ſeem to afford us the only means Practicable for the *Seaman*. However before Saylors can make uſe of the Art of finding the *Longitude*, it will be requiſite that the Coaſt of the whole Ocean be firſt laid down truly, for which work this Method by the *Satellites* is moſt appoſite: And it may be hoped that either the true Geometrick Theory of the *Moon* may be diſcovered, by the time the Charts are compleated; or elſe that ſome Invention of ſhorter Teleſcopes manageable on Ship-board, may ſuffice to ſhew the *Eclipſes* of the *Satellites* at Sea, at leaſt thoſe of the Third *Satellite*, which fall at a good diſtance from the Body of *Jupiter*, being near three times as far from him as the firſt.

The laſt but moſt conſiderable Treatiſe of this Collection gives the aforeſaid Tables for computing the Motions of *Jupiter's Satellites*, but more eſpecially thoſe, for ſpeedy finding the Eclipſes of the firſt or innermoſt. Wherein Monſieur *Caſſini* has employed his Skill to make eaſie and obvious to all Capacities the Calculation of them, which is otherwiſe operoſe to the Skilful, and not to be undertaken by the leſs knowing, who yet perhaps would be willing to find the Longitude of the Places they live in.

Theſe Tables have for Principles, That the innermoſt *Satellite* revolves to the Sun in $1^{d.}\,18^{h.}\,28'.\,36''$. ſo preciſely, that in 100 Years the difference is not ſenſible; That in the time of the Revolution of *Jupiter* to his *Aphelion*, which he ſuppoſes in $4332^{d.}\,14^{h.}\,52'.\,48''$, this *Satellite* makes exactly 2448 Months or Revolutions to the Sun: and dividing the Orbite of *Jupiter* into 2448 parts, he has in a large Table of Æquation ſhewn what is the inequality of the Motion of *Jupiter* in each Revolution reduced to Time, aſſuming *Thirdly*, the greateſt Æquation of *Jupiter* $5^{\circ}.\,30'$. whence the hourly Motion of the *Satellite* from *Jupiter* being $8^{\circ}.\,26'\frac{1}{4}$, it follows, that the greateſt inequality (*Jupiter* paſſing the Signs of *Cancer* and *Capricorn*,) amounts to $39'.\,8''$. of time, to be added in *Cancer*, ſubſtracted in *Capricorn*. *Laſtly*, As to the *Epocha* or beginning of this Series of Revolutions, he has determined the *Aphelion* of *Jupiter* about 1 ½ Degree forwarder than *Aſtronomia Carolina*, and above 2 Degrees more than the *Rudolphine Tables*, *viz.* preciſely in 9° of *Libra*, in the beginning of this Century, which perhaps he finds the proper Motion of *Jupiter* about the Sun at this time to require; and the number of Revolutions ſince *Jupiter* was laſt in *Perihelio*, is here ſtiled *Num.* I.

A ſecond Inequality is that which depends on the diſtance of the Sun from *Jupiter*, which he ſays Monſieur *Romer* did moſt ingeniouſly explain by the Hypotheſis of the Motion of Light; to which yet *Caſſini* by his manner of *Calculus* ſeems not to aſſent, though it be hard to imagine how the Earth's Poſition in reſpect of *Jupiter* ſhould any way affect the Motion of the *Satellites*. This Inequality he makes to amount to two Degrees in the *Satellites* Motion, or 14′. 10″. of Time, wherein he ſuppoſes the Eclipſes to happen ſo much ſooner when *Jupiter* Oppoſes the Sun, than when he is in Conjunction with him. The diſtribution of this Inequality he makes wholly to depend on the Angle at the Sun between the Earth and *Jupiter*, without any regard to the Excentricity of *Jupiter*, (who is ſometimes ½ a Semidiameter of the Earth's Orb farther from the Sun than at other times) which would occaſion a much greater difference than the Inequality of *Jupiter* and the *Earth's* Motion, both of which are accounted for in theſe Tables with great Skill and Addreſs. But what is moſt ſtrange, he affirms that the ſame Inequality of two Degrees in the Motion, is likewiſe found in the other *Satellites*, requiring a much greater time, as above two Hours in the fourth *Satellite*: which if it appeared by Obſervation, would overthrow Monſieur *Romer's* Hypotheſis entirely. Yet I doubt not herein to make it demonſtratively plain, that the Hypotheſis of the progreſſive Motion of Light is found in all the other *Satellites* of *Jupiter* to be neceſſary, and that it is the ſame in all; there being nothing near ſo great an Annual Inequality as Monſieur *Caſſini* ſuppoſes in their Motions, by his Table, *pag*. 9. and his *Præcepta Calculi*. The Method however uſed to compute this is very Curious; for having found that whilſt the Sun revolves to *Jupiter*, there paſs 398$^{d.}$ 21$^{h.}$ 13′. wherein are made 225 ⅜ Revolutions of the *Satellite* to *Jupiter*, the Number of Revolutions ſince *Jupiter* was laſt in Oppoſition to the Sun, is what he calls *Num*. II. in which the Inequality of the Earth's Motion is allowed for in the Months, and that of *Jupiter's* Orb by a Table of the Æquation of *Num*. II. amounting in all to 3½ Revolutions of the *Satellite* to *Jupiter*. This in the Tables following I have thought fit to leave out, ſhewing how to find it by help of the former Æquation of *Num*. I. The Numbers are in effect the ſame with Monſieur *Caſſini's*, only reduced to our Stile and Meridian, and the form of them abridged, and 'tis hoped amended. *See* Philoſ. Tranſact. N°. 136.

Epochæ Revolutionum primi Satellitis *ad* Jovis *Umbram ſub Meridiano* Londinenſi.

Anno Jul. Curr.	D.	h.	′	″	Num. I.	Num. II.	Anno Jul. Curr.	D.	h.	′	″	Num. I.	Num. II.
1660	0	11	5	48	968	200,6	1690	0	16	8	24	2263	81,0
61	0	1	17	24	1174	181,2	91	0	6	20	0	21	61,6
62	1	9	57	36	1381	162,9	92	0	15	0	12	228	43,3
63	1	0	9	12	1587	143,5	93	0	5	11	48	434	23,9
1664	1	8	49	24	1794	125,1	94	1	13	52	0	641	5,5
65	0	23	1	0	2000	105,7	1695	1	4	3	36	847	211,5
66	0	13	12	36	2206	86,4	96	1	12	43	48	1054	193,1
67	0	3	24	12	2412	67,0	97	1	2	55	24	1260	173,7
68	0	12	4	24	171	48,6	98	0	17	7	0	1466	154,4
1669	0	2	16	0	377	29,2	99	0	7	18	36	1672	135,0
70	1	10	56	12	584	10,9	1700	0	15	58	48	1879	116,6
71	1	1	7	48	790	216,9	01	0	6	10	24	2085	97,3
72	1	9	48	0	997	198,5	02	1	14	50	36	2292	78,9
73	0	23	59	36	1203	179,1	03	1	5	2	12	50	59,5
1674	0	14	11	12	1409	159,7	04	1	13	42	24	257	41,1
75	0	4	22	48	1615	140,3	1705	1	3	54	0	463	21,8
76	0	13	3	0	1822	121,9	06	0	18	5	36	669	2,4
77	0	3	14	36	2028	102,5	07	0	8	17	12	875	208,4
78	1	11	54	48	2235	84,1	08	0	16	57	24	1082	190,0
1679	1	2	6	24	2441	64,7	09	0	7	9	0	1288	170,6
80	1	10	46	36	200	46,4	1710	1	15	49	12	1495	152,3
81	1	0	58	12	406	27,0	11	1	6	0	48	1701	132,9
82	0	15	9	48	612	7,6	12	1	14	41	0	1908	114,5
83	0	5	21	24	818	213,6	13	1	4	52	36	2114	95,1
1684	0	14	1	36	1025	195,3	14	0	19	4	12	2320	75,8
85	0	4	13	12	1231	175,9	1715	0	9	15	48	78	56,4
86	1	12	53	24	1438	157,5	16	0	17	56	0	285	38,0
87	1	3	5	0	1644	138,1	17	0	8	7	36	491	18,6
88	1	11	45	12	1851	119,7	18	1	16	47	48	698	0,3
1689	1	1	56	48	2057	100,4	19	1	6	59	24	904	206,3
							1720	1	15	39	36	1111	187,9

Tabula

Tabula Revolutionum primi Satellitis Jovis *in Anno.*

Januarius. D.	h.	′	″	Num. I.	Num. II.
0	0	0	0	0	0,0
1	18	28	36	1	1,0
3	12	57	12	2	2,1
5	7	25	48	3	3,1
7	1	54	24	4	4,1
8	20	23	0	5	5,2
10	14	51	36	6	6,2
12	9	20	12	7	7,2
14	3	48	48	8	8,2
15	22	17	24	9	9,3
17	16	46	0	10	10,3
19	11	14	36	11	11,3
21	5	43	12	12	12,3
23	0	11	48	13	13,4
24	18	40	24	14	14,4
26	13	9	0	15	15,4
28	7	37	36	16	16,5
30	2	6	12	17	17,5
31	20	34	48	18	18,5
Februarius.					
0	20	34	48	18	18,5
2	15	3	24	19	19,6
4	9	32	0	20	20,6
6	4	0	36	21	21,6
7	22	29	12	22	22,6
9	16	57	48	23	23,7
11	11	26	24	24	24,7
13	5	55	0	25	25,7

Februarius. D.	h.	′	″	Num. I.	Num. II.
13	5	55	0	25	25,7
15	0	23	36	26	26,7
16	18	52	12	27	27,7
18	13	20	48	28	28,7
20	7	49	24	29	29,7
22	2	18	0	30	30,8
23	20	46	36	31	31,8
25	15	15	12	32	32,8
27	9	43	48	33	33,8
Martius.					
1	4	12	24	34	34,8
2	22	41	0	35	35,8
4	17	9	36	36	36,8
6	11	38	12	37	37,9
8	6	6	48	38	38,9
10	0	35	24	39	39,9
11	19	4	0	40	40,9
13	13	32	36	41	41,9
15	8	1	12	42	42,9
17	2	29	48	43	43,9
18	20	58	24	44	44,9
20	15	27	0	45	45,9
22	9	55	36	46	46,9
24	4	24	12	47	47,9
25	22	52	48	48	48,9
27	17	21	24	49	49,9
29	11	50	0	50	50,9
31	6	18	36	51	51,9

Tabula Revolutionum primi Satellitis Jovis *in Anno.*

Aprilis.					
D.	h.	′	″	Num. I.	Num. II.
0	6	18	36	51	51,9
2	0	47	12	52	52,9
3	19	15	48	53	53,9
5	13	44	24	54	54,9
7	8	13	0	55	55,9
9	2	41	36	56	56,9
10	21	10	12	57	57,9
12	15	38	48	58	58,9
14	10	7	24	59	59,9
16	4	36	0	60	60,8
17	23	4	36	61	61,8
19	17	33	12	62	62,8
21	12	1	48	63	63,8
23	6	30	24	64	64,8
25	0	59	0	65	65,7
26	19	27	36	66	66,7
28	13	56	12	67	67,7
30	8	24	48	68	68,6
Maius.					
0	8	24	48	68	68,6
2	2	53	24	69	69,6
3	21	22	0	70	70,6
5	15	50	36	71	71,6
7	10	19	12	72	72,5
9	4	47	48	73	73,5
10	23	16	24	74	74,5
12	17	45	0	75	75,5
14	12	13	36	76	76,4

Maius.					
D.	h.	′	″	Num. I.	Num. II.
14	12	13	36	76	76,4
16	6	42	12	77	77,4
18	1	10	48	78	78,4
19	19	39	24	79	79,3
21	14	8	0	80	80,3
23	8	36	36	81	81,3
25	3	5	12	82	82,3
26	21	33	48	83	83,3
28	16	2	24	84	84,2
30	10	31	0	85	85,2
Junius.					
1	4	59	36	86	86,1
2	23	28	12	87	87,1
4	17	56	48	88	88,0
6	12	25	24	89	89,0
8	6	54	0	90	90,0
10	1	22	36	91	90,9
11	19	51	12	92	91,9
13	14	19	48	93	92,9
15	8	48	24	94	93,8
17	3	17	0	95	94,8
18	21	45	36	96	95,7
20	16	14	12	97	96,7
22	10	42	48	98	97,7
24	5	11	24	99	98,6
25	23	40	0	100	99,6
27	18	8	36	101	100,6
29	12	37	12	102	101,5

Tabula Revolutionum primi Satellitis Jovis *in Anno.*

Julius. D.	h.	′	″	Num. I.	Num. II.
1	7	5	48	103	102,5
3	1	34	24	104	103,5
4	20	3	0	105	104,4
6	14	31	36	106	105,4
8	9	0	12	107	106,4
10	3	28	48	108	107,3
11	21	57	24	109	108,3
13	16	26	0	110	109,3
15	10	54	36	111	110,2
17	5	23	12	112	111,2
18	23	51	48	113	112,2
20	18	20	24	114	113,1
22	12	49	0	115	114,1
24	7	17	36	116	115,1
26	1	46	12	117	116,0
27	20	14	48	118	117,0
29	14	43	24	119	118,0
31	9	12	0	120	119,0
Auguſtus.					
0	9	12	0	120	119,0
2	3	40	36	121	119,9
3	22	9	12	122	120,9
5	16	37	48	123	121,9
7	11	6	24	124	122,9
9	5	35	0	125	123,8
11	0	3	36	126	124,8
12	18	32	12	127	125,8
14	13	0	48	128	126,8

Auguſtus. D.	h.	′	″	Num. I.	Num. II.
14	13	0	48	128	126,8
16	7	29	24	129	127,7
18	1	58	0	130	128,7
19	20	26	36	131	129,7
21	14	55	12	132	130,7
23	9	23	48	133	131,7
25	3	52	24	134	132,7
26	22	21	0	135	133,6
28	16	49	36	136	134,6
30	11	18	12	137	135,6
September.					
1	5	46	48	138	136,6
3	0	15	24	139	137,6
4	18	44	0	140	138,6
6	13	12	36	141	139,6
8	7	41	12	142	140,6
10	2	9	48	143	141,5
11	20	38	24	144	142,5
13	15	7	0	145	143,5
15	9	35	36	146	144,5
17	4	4	12	147	145,5
18	22	32	48	148	146,5
20	17	1	24	149	147,5
22	11	30	0	150	148,5
24	5	58	36	151	149,5
26	0	27	12	152	150,5
27	18	55	48	153	151,5
29	13	24	24	154	152,5

Tabula Revolutionum primi Satellitis Jovis *in Anno.*

D.	h.	′	″	Num. I.	Num. II.
October.					
1	7	53	0	155	153,5
3	2	21	36	156	154,5
4	20	50	12	157	155,5
6	15	18	48	158	156,5
8	9	47	24	159	157,5
10	4	16	0	160	158,5
11	22	44	36	161	159,5
13	17	13	12	162	160,5
15	11	41	48	163	161,6
17	6	10	24	164	162,6
19	0	39	0	165	163,6
20	19	7	36	166	164,6
22	13	36	12	167	165,6
24	8	4	48	168	166,6
26	2	33	24	169	167,7
27	21	2	0	170	168,7
29	15	30	36	171	169,7
31	9	59	12	172	170,7
November.					
0	9	59	12	172	170,7
2	4	27	48	173	171,8
3	22	56	24	174	172,8
5	17	25	0	175	173,8
7	11	53	36	176	174,8
9	6	22	12	177	175,9
11	0	50	48	178	176,9
12	19	19	24	179	177,9
14	13	48	0	180	178,9
16	8	16	36	181	180,0
November.					
16	8	16	36	181	180,0
18	2	45	12	182	181,0
19	21	13	48	183	182,0
21	15	42	24	184	183,0
23	10	11	0	185	184,0
25	4	39	36	186	185,1
26	23	8	12	187	186,1
28	17	36	48	188	187,2
30	12	5	24	189	188,2
December.					
0	12	5	24	189	188,2
2	6	34	0	190	189,2
4	1	2	36	191	190,3
5	19	31	12	192	191,3
7	13	59	48	193	192,3
9	8	28	24	194	193,4
11	2	57	0	195	194,4
12	21	25	36	196	195,5
14	15	54	12	197	196,5
16	10	22	48	198	197,6
18	4	51	24	199	198,6
19	23	20	0	200	199,7
21	17	48	36	201	200,7
23	12	17	12	202	201,8
25	6	45	48	203	202,8
27	1	14	24	204	203,9
28	19	43	0	205	204,9
30	14	11	36	206	206,0

Tabula Primæ Æquationis Conjunctionum primi Satellitis *cum* Jove.

Num. I.	Æquat.		Num. I.	Æquat.		Num. I.	Æquat.		Num. I.	Æquat.	
	′	″		′	″		′	″		′	″
0	0	0	300	28	9	610	39	5	920	26	37
10	1	3	310	28	54	620	39	3	930	25	53
20	2	5	320	29	35	630	38	58	940	25	8
30	3	8	330	30	11	640	38	51	950	24	23
40	4	12	340	30	45	650	38	44	960	23	37
50	5	15	350	31	28	660	38	34	970	22	50
60	6	16	360	32	10	670	38	24	980	22	3
70	7	19	370	32	44	680	38	10	990	21	15
80	8	20	380	33	15	690	37	56	1000	20	26
90	9	23	390	33	49	700	37	40	1010	19	37
100	10	25	400	34	20	710	37	24	1020	18	47
110	11	25	410	34	51	720	37	5	1030	17	56
120	12	25	420	35	21	730	36	45	1040	17	5
130	13	25	430	35	47	740	36	25	1050	16	13
140	14	25	440	36	6	750	36	4	1060	15	19
150	15	22	450	36	26	760	35	40	1070	14	25
160	16	18	460	36	47	770	35	15	1080	13	32
170	17	17	470	37	8	780	34	49	1090	12	37
180	18	11	480	37	29	790	34	19	1100	11	42
190	19	9	490	37	44	800	33	49	1110	10	47
200	20	5	500	37	59	810	33	21	1120	9	52
210	20	56	510	38	16	820	32	50	1130	8	57
220	21	49	520	38	29	830	32	17	1140	8	0
230	22	41	530	38	39	840	31	44	1150	7	3
240	23	32	540	38	49	850	31	10	1160	6	7
250	24	20	550	38	55	860	30	32	1170	5	10
260	25	7	560	38	59	870	29	56	1180	4	13
270	25	57	570	39	3	880	29	19	1190	3	15
280	26	43	580	39	6	890	28	40	1200	2	19
290	27	27	590	39	8	900	27	59	1210	1	21
300	28	9	600	39	7	910	27	19	1220	0	24
			610	39	5	920	26	37	1224	0	0

Tabula Secundæ Æquationis Conjunctionum primi Satellitis *cum* Jove.

Num. II.	Æquat. add.		Num. II.	Æquat. add.		Num. II.	Æquat. add.		Num. II.	Æquat. add.	
0	0′	0″	28	2′	4″	56	7′	0″	84	12′	0″
1	0	0	29	2	13	57	7	12	85	12	9
2	0	1	30	2	21	58	7	24	86	12	16
3	0	2	31	2	30	59	7	36	87	12	24
4	0	3	32	2	39	60	7	47	88	12	32
5	0	4	33	2	48	61	7	59	89	12	40
6	0	6	34	2	58	62	8	11	90	12	47
7	0	8	35	3	8	63	8	22	91	12	53
8	0	10	36	3	17	64	8	34	92	13	0
9	0	14	37	3	27	65	8	46	93	13	6
10	0	17	38	3	37	66	8	57	94	13	13
11	0	20	39	3	48	67	9	8	95	13	19
12	0	23	40	3	59	68	9	20	96	13	24
13	0	27	41	4	9	69	9	32	97	13	30
14	0	32	42	4	20	70	9	44	98	13	35
15	0	37	43	4	31	71	9	54	99	13	39
16	0	42	44	4	41	72	10	3	100	13	45
17	0	47	45	4	53	73	10	14	101	13	48
18	0	53	46	5	4	74	10	25	102	13	51
19	0	58	47	5	15	75	10	35	103	13	54
20	1	4	48	5	27	76	10	45	104	13	57
21	1	11	49	5	39	77	10	55	105	14	0
22	1	18	50	5	50	78	11	5	106	14	3
23	1	25	51	6	2	79	11	15	107	14	5
24	1	32	52	6	14	80	11	25	108	14	7
25	1	40	53	6	25	81	11	34	109	14	8
26	1	47	54	6	37	82	11	43	110	14	9
27	1	56	55	6	49	83	11	52	111	14	10
28	2	4	56	7	0	84	12	0	112	14	10

Tabula Dimidiæ Moræ primi Satellitis *in Umbra* Jovis.

Num.I.	H.	'	"	Num.I.	H.	'	"
0	1	4	56	1200	1	5	6
40	1	4	33	1240	1	4	48
80	1	4	12	1280	1	4	26
120	1	3	59	1320	1	4	7
160	1	3	48	1360	1	3	54
200	1	3	39	1400	1	3	38
240	1	3	38	1440	1	3	38
280	1	3	48	1480	1	3	44
320	1	4	1	1520	1	3	52
360	1	4	16	1560	1	4	7
400	1	4	36	1600	1	4	24
440	1	4	56	1640	1	4	42
480	1	5	18	1680	1	5	0
520	1	5	41	1720	1	5	22
560	1	6	1	1760	1	5	46
600	1	6	21	1800	1	6	10
640	1	6	39	1840	1	6	28
680	1	6	53	1880	1	6	45
720	1	7	3	1920	1	6	57
760	1	7	11	1960	1	7	7
800	1	7	15	2000	1	7	13
840	1	7	13	2040	1	7	14
880	1	7	9	2080	1	7	15
920	1	7	2	2120	1	7	15
960	1	6	54	2160	1	7	10
1000	1	6	39	2200	1	6	49
1040	1	6	22	2240	1	6	32
1080	1	6	5	2280	1	6	15
1120	1	5	45	2320	1	5	58
1160	1	5	26	2360	1	5	38
1200	1	5	6	2400	1	5	18
				2440	1	5	2

TABULA ÆQUATIONIS DIERUM
cum Solis loco adeunda.

	♈		♉		♊		♋		♌		♍	
G.	' S	"	' A	"	' A	"	' S	"	' S	"	' S	"
0	7	45	1	11	4	3	0	59	5	43	2	8
1	7	26	1	24	4	0	1	15	5	45	1	53
2	7	7	1	37	3	56	1	29	5	46	1	37
3	6	48	1	49	3	51	1	42	5	47	1	21
4	6	29	2	1	3	45	1	54	5	48	1	5
5	6	10	2	12	3	39	2	6	5	48	0	48
6	5	51	2	23	3	32	2	19	5	48	0	30
7	5	31	2	33	3	25	2	32	5	46	0	12
8	5	11	2	43	3	17	2	44	5	44	0 A	7
9	4	51	2	53	3	9	2	56	5	40	0	26
10	4	31	3	3	3	0	3	8	5	36	0	45
11	4	11	3	13	2	51	3	20	5	31	1	3
12	3	52	3	22	2	41	3	32	5	25	1	21
13	3	33	3	30	2	31	3	43	5	19	1	40
14	3	14	3	37	2	21	3	54	5	13	1	59
15	2	55	3	43	2	10	4	4	5	6	2	19
16	2	37	3	48	2	0	4	14	4	58	2	40
17	2	19	3	53	1	49	4	24	4	49	3	1
18	2	1	3	57	1	37	4	34	4	39	3	22
19	1	43	4	1	1	25	4	43	4	30	3	44
20	1	26	4	5	1	13	4	51	4	20	4	6
21	1	9	4	8	1	1	4	59	4	9	4	29
22	0	52	4	10	0	49	5	6	3	57	4	51
23	0	35	4	12	0	37	5	13	3	45	5	13
24	0	19	4	13	0	24	5	19	3	32	5	35
25	0	3	4	11	0	10	5	24	3	19	5	57
26	0 A	12	4	9	0 S	3	5	29	3	5	6	19
27	0	27	4	8	0	16	5	33	2	51	6	41
28	0	42	4	6	0	29	5	37	2	37	7	2
29	0	57	4	5	0	44	5	40	2	23	7	23
30	1	11	4	3	0	59	5	43	2	8	7	44

TABULA ÆQUATIONIS DIERUM.

	♎		♏		♐		♑		♒		♓	
G.	′ A	″	′ A	″	′ A	″	′ A	″	′ S	″	′ S	″
0	7	44	15	34	13	25	0	59	11	48	14	36
1	8	5	15	42	13	7	0	27	12	4	14	29
2	8	25	15	48	12	48	0 S	5	12	19	14	21
3	8	45	15	53	12	29	0	35	12	35	14	13
4	9	5	15	57	12	10	1	4	12	50	14	4
5	9	25	16	1	11	50	1	33	13	5	13	55
6	9	44	16	5	11	30	2	3	13	19	13	46
7	10	3	16	7	11	10	2	32	13	32	13	37
8	10	22	16	8	10	49	3	1	13	44	13	27
9	10	41	16	9	10	28	3	29	13	55	13	17
10	11	0	16	9	10	6	3	57	14	5	13	7
11	11	19	16	9	9	42	4	25	14	14	12	56
12	11	38	16	8	9	17	4	53	14	22	12	44
13	11	57	16	7	8	51	5	20	14	29	12	32
14	12	15	19	5	8	25	5	48	14	35	12	19
15	12	33	16	1	7	58	6	15	14	40	12	6
16	12	50	15	56	7	31	6	42	14	45	11	52
17	13	7	15	50	7	5	7	9	14	50	11	37
18	13	22	15	44	6	38	7	34	14	54	11	21
19	13	36	15	37	6	12	7	58	14	56	11	4
20	13	49	15	30	5	45	8	21	14	58	10	46
21	14	2	15	22	5	19	8	45	14	59	10	28
22	14	14	15	13	4	52	9	8	15	0	10	10
23	14	26	15	3	4	26	9	31	15	0	9	52
24	14	37	14	52	3	58	9	53	15	0	9	34
25	14	47	14	40	3	30	10	13	14	58	9	16
26	14	57	14	27	3	1	10	32	14	55	8	58
27	15	7	14	13	2	31	10	51	14	51	8	40
28	15	16	13	58	2	1	11	10	14	47	8	22
29	15	25	13	42	1	30	11	29	14	42	8	4
30	15	34	13	25	0	59	11	48	14	36	7	[illegible]

This laſt Table of the Æquation of Natural Days might have been ſpared, as being publiſht in ſeveral other places, but it was thought proper to have all the *Elements* of this *Calculus* together, that there might be no occaſion of any other Book to perform it.

The Uſe of the Tables.

To any given Year, Month, and Day, to find the next Eclipſe of the firſt Satellite *of* Jupiter.

I. In the Table of *Epochæ* (*pag.* 240.) find the Year of our Lord, and ſet down the Day, Hours, Minutes, and Seconds, with the Num. I. and Num. II. thereto annext; and (in *pag.* 241 and the following) ſeek the Month, and day of the Month, with the Hours and Minutes, and Num. I. and II. affixt, and add them together: and the reſpective Sums ſhall ſhew the mean time of the middle of the Eclipſe ſought, with Num. I. and Num. II. required. But it muſt be obſerved, that in *January* and *February* in the Leap-Year one Day is to be added to the Day thus found.

II. If Num. I. be found leſs than 1224 with Num. I; or if greater than 2448, Subſtracting 2448 therefrom, with the reſidue, enter the Table, *pag.* 245. and you will have the firſt Æquation to be *added* to the mean Time before found. But if Num. I. be leſs than 2448, but greater than 1224, Subſtract it from 2448, and entring the ſame Table with the remainder, you ſhall have the firſt Æquation to be *ſubſtracted* from the mean Time. Then Divide the Minutes of the ſaid firſt Æquation by 11, or rather $\frac{34}{3}$, and the *Quote* ſhall be the Æquation of Num. II. (anſwering to the Eccentrick Motion of *Jupiter*) to be *added* thereto when the firſt Æquation *Subſtracts*, and *è contra ſubſtracted* when that *adds*.

III. If Num. II. thus æquated exceed 225,4, Subſtract 225,4 therefrom; and if the remainder or Num. II. be leſs than 113, with the ſaid remainder or Number; or if greater than 113, with the complement thereof to 225,4. ſeek in Table *pag.* 246. the ſecond Æquation, which being added to the Time before found, gives the true Time of the middle of the Eclipſe.

IV. With Num. I. in *Tab. pag.* 247, ſeek the half Continuance of the Total Eclipſe, which is to be added for the *Emerſion* when the æquated Num. II. is leſs than 113, or if more than 225,4, it be leſs than 338. But if it exceed 113 or 338, then is the *Semimora* to be ſubſtracted for the *Immerſion.*

V. Laſtly, with the Sun's true Place take out the Æquation of Natural Days (in *Tab. pag.* 248.) which added or ſubſtracted according to the Title, gives the time of the *Immerſion* or *Emerſion* ſought.

Now how few Figures ſerve for this Computation, will beſt appear by an Example or two.

Anno 1677. *September* 17th. $8^{h.}$ 9′. 40″. at *Greenwich,* Mr. *Flamſteed* obſerved the firſt *Satellite* to begin to *Emerge*; that is $8^{h.}$ 9′. 20″. at *London.*

					Num. I.	Num. II.
1677.	$0^{d.}$	$3^{h.}$	14′	36″	2028	102,5
Sept.	17	4	4	12	147	145,5
Sept.	17	7	18	48	2175	248,0
Æquat. 1.	—		26	11	2448	2,3 +
	17	6	52	37	273	250,3
Æquat. 2.	+		1	39		225,4
Semimora	+	1	7	0		24,9
Equal Time	17	8	1	16	11)26,2(2,3 +	
Æquation	+		9	25	☉ in ≏ 5,00	
Appar. T.	17	8	10	41		
Obſer.		8	9	20		
Error		—	1	21		

Again, *Anno* 1683. *November* 30th. $16^{h.}$ 48′. 40″. under the Meridian of *London*, the *Immerſion* of this *Satellite* was obſerved by *E. Halley*.

					Num. I.	Num. II.
1683.	$0^{d.}$	$5^{h.}$	$21'$	$24''$	818	213,6
Novemb.	30	12	5	24	189	188,2
Novemb.	30	17	26	48	1007	401,8
Æquat. 1.	+		19	52		1,8 —
Æquat. 2.	+		6	0	11)20(1,8—	400,0
Novemb.	30	17	52	40		225,4
Semimora	—	1	6	36		174,6
Temp.æquat.	30	16	46	4		50,8
Æquat. T.	+		6	3	⊙ in ♐ 19°. 20′.	
Novemb.	30	16	52	7	Temp. appar.	
Obſer.		16	48	40		
Error	—		3	27		

A Third Example ſhall be the *Emerſion* obſerved at *Paris* by Monſieur *Caſſini Anno* 1693. *January* 14th. $10^{h.}$ 40′. 28″. that is, at *London* at $10^{h.}$ 30′. 48″.

					Num. I.	Num. II.
1693.	$0^{d.}$	$5^{h.}$	$11'$	$48''$	434	23,9
Jan.	14	3	48	48	8	8,2
Æquat. 1.	+		36	8	442	32,1
Æquat. 2.	+		2	13		3,2 —
Semimora	+	1	4	57	11)36,(3,2—	28,9
Temp.æquat.	14	10	43	54		
Æquat.	—		13	15	⊙ in ♒ 5°. 40′.	
Januarii	14	10	30	39	Temp. app.	
Obſer.		10	30	48		
Error	+		0	9		

After this manner I have compared theſe Tables with many good and certain Obſervations, and ſcarce ever find them err above three or four Minutes of Time; which proceeds, as may well be conjectured, from ſome ſmall Eccentricity in its Motion, and from the Oval Figure of *Jupiter*'s Body, whoſe quick diurnal Rotation has by its *Vis Centrifuga* dilated his Equinoctial, and made his *Meridians* much *Elliptical*, ſo as to be diſcernable by the Teleſcope. Mr. *Newton* has ſhewn that his Polar Diameter is to that of his Equinoctial as 40 to 41 nearly. But we may hope future Obſervations may ſhew how to divide thoſe compounded cauſes of Error, and correct them; which Errors are exceeding ſmall in compariſon of the ſhort time that the *Satellites* have been diſcovered, and argue the Skill and Diligence of the deſervedly Famous Author of theſe *Tables*.

I had almoſt forgot the Conſtruction of the Table, *pag.* 247. ſhewing the half continuance of theſe Eclipſes: In this the Semidiameter of the ſhadow of *Jupiter* is made by *Caſſini* juſt 10 Degrees, and that of the *Satellite* 30′; and the *Satellites* Aſcending Node being ſuppoſed in 15°. of *Aquarius*, at the end of this Century, (that is, 55°. 20′. before the *Perihelion* of *Jupiter*) it will thence follow, that Num. I. being 816 or 2102, *Jupiter* paſſes the *Nodes* of the *Satellites* Orb, and conſequently theſe Eclipſes are Central, and of the greateſt Duration. But Num. I. being 215 or 1481, the *Satellite* paſſes the ſhadow with the greateſt Obliquity, *viz.* 2°. 55′ from the Center, whence the *Semimora* becomes of all the ſhorteſt. This Table is not however ſo nicely computed, but that it may admit of Correction in the Seconds, if a ſmall part of a Minute were conſiderable in this affair.

The Tables of the other *three Satellites* not being ſo perfect or exact as thoſe of the *firſt*, having greater inequalities, are here given in another form, requiring the aſſiſtance of the Tables of *Jupiter*'s proper motion. The Periods of their Revolutions to *Jupiter*'s ſhade are as follows:

Period. Secundi.	$3^{d.}$	$13^{h.}$	17′.	54″.	3‴	*ſive* $2\frac{1}{123}$ *Rev.primi.*
Period. Tertii.	7	. 3	59	39	22	*ſive* $4\frac{3}{81}$ *Rev.primi.*
Period. Quarti.	16	18	5	6	50	*ſive* $9\frac{7}{15}$ *Rev.primi.*

Whence the Table of the firſt Æquation of the *Firſt Satellite, pag.* 245, or Monſieur *Caſſini*'s larger Table, may by an eaſie Reduction ſerve the other three; the Æquation of the *Second* being $2\frac{1}{123}$, or twice the Minutes with half ſo many Seconds as there are Minutes in the Æquation of the *Firſt*, and the greateſt Æquation thereof $1^{h.}$ 18′. 35″. The Æquation of the *Third* is $4\frac{1}{20}$ times greater than that of the *Firſt*, and when greateſt amounteth to $2^{h.}$ 38′. 29″. And the Æquation of the *Fourth* being $9\frac{7}{15}$ times that of the *Firſt*, is had by Subſtracting $\frac{1}{2}$ and $\frac{1}{30}$ from *ten times* the Æquation of the *Firſt*, whence the greateſt becomes $6^{h.}$ 10′. 28″. So that Num. I. and Num. II. as here collected for the *Firſt*, may indifferently ſerve all the reſt.

As to the Second Æquation of the other *Satellites*, Monſieur *Caſſini* has, by his *Præcepta Calculi* (as is before mentioned) ſuppoſed the Minutes thereof to be increaſed in the ſame proportion; as inſtead of 14′. 10″. in the *Firſt*, to be 28′. 27″. in the *Second*, 57′. 22″. in the *Third*, and no leſs than $2^{h.}$ 14′. 7″. in the *Fourth*; whereas if this ſecond Inequality did proceed from the ſucceſſive propagation of Light, this Æquation ought to be the ſame in all of them, which Monſieur *Caſſini* ſays was wanting to be ſhewn, to perfect Monſieur *Romer*'s Demonſtration; wherefore he has rejected it as ill founded. But there is good cauſe to believe that his motive thereto, is what he has thought not proper to diſcover. And the following Obſervations do ſufficiently ſupply the Defect complained of in the making out of that Hypotheſis.

Anno 1676. *Octob.* 2. *Stil. Nov.* $6^{h.}$ 10′. 37″. *app.* but $5^{h.}$ 59′. 37″. *æq. time*, Monſieur *Caſſini* at *Paris* obſerved the *Emerſion* of the *Third Satellite* from *Jupiter*'s ſhadow. And again, *Novemb.* 14 following, $6^{h.}20'.55''$. *app. Time*, but $6^{h.}5'.55''$. *æq. T.* he obſerved the like *Emerſion* of the ſame *Satellite.* The obſerved Interval of Time between theſe *Emerſions* was $43^{d.}0^{h.}6'.18''$. which is $8'.22''$. more than 6 mean Revolutions of this *Satellite*, of which $4'.27''$. ariſes from the difference of the firſt Æquations and the greater continuance of the latter Eclipſe; ſo that the other 4 Minutes is all that is left to anſwer for the difference of the ſecond Æquations; and Num. II. in that time increaſing from 48 to 72, gives $4'.36''$. for the difference of the ſecond Æquations of the *Firſt Satellite.* So that here the ſecond Æquation of the *Third* is found rather leſs than that of the *Firſt*, but the difference is ſo ſmall, that it may rather be attributed to the uncertainty of Obſervation. Whereas according to Monſieur *Caſſini*'s Method of Calculating, inſtead of four Minutes it ought to be $18'.38''$. and the Interval of theſe two *Emerſions* $43^{d.}0^{h.}21'$. exceeding the Time obſerved by a whole quarter of an hour; which that Curious Obſerver could not be deceived in.

The like appears yet more evidently in the *Fourth Satellite.* By the Obſervation of Mr. *Flamſteed* at *Greenwich*, *Anno* 1682. *Sept.* $24^{o.}17^{h.}45'$. T. app. but $17^{h.}32'\frac{1}{2}$ T. æq. the *Fourth Satellite* was ſeen newly come out of the ſhadow, ſo that about $17^{h.}30'$. T. æq. the firſt beginning of *Emerſion* was conjectured; and after five Revolutions, *viz.* *Decemb.* $17^{d.}11^{h.}16'$. or $11^{h.}18'$. T. æq. he again obſerved the firſt appearance of the *Satellite* beginning to Emerge, that is, after an Interval of $83^{d.}17^{h.}48'$; whereas this *Satellite* makes five mean Revolutions in $83^{d.}18^{h.}25'\frac{1}{2}$. Here we have $37'\frac{1}{2}$ to be accounted for by the ſeveral Inequalities. Of this $21'$ is due to the firſt Æquations, which is reduced to $19'$ by the greater continuance of the latter Eclipſe, *Jupiter* then approaching to his deſcending Node: So that there remains only $18'\frac{1}{2}$ for the difference of the Second Æquations,whilſt the *Earth* approached *Jupiter* by more than the *Radius* of its own *Orb*; and the difference of the ſecond Æquations of the *Firſt Satellite* being according to *Caſſini* $8'.\ 30''$, the ſaid difference in the *Fourth* ought to be $1^{h.}\ 20'\frac{1}{2}$ inſtead of $18\frac{1}{2}$; whence the Interval of theſe two *Emerſions* would be according to his Precepts, but $83^{d.}\ 16^{h.}\ 46'$, inſtead of $83^{d.}\ 17^{h.}\ 48'$. obſerved. And whereas $18'\frac{1}{2}$ may ſeem too great a difference; it muſt be noted, firſt, that Monſieur *Romer* had ſtated the whole ſecond Æquation $22'.00''$, (*vide Phil. Tranſ. Num.* 136.) which Monſieur *Caſſini* has diminiſhed to $14'.10''$; ſo that inſtead of $8'\frac{1}{2}$, Monſieur *Romer* allows above $13'$; and ſecondly, that in the firſt of theſe Obſervations, being about half an hour before Sun-riſe, the brightneſs of the Morning might well hinder the ſeeing of this ſmalleſt and ſloweſt *Satellite*, till ſuch time as a good part thereof was emerged.

But I have exceeded the Bounds of my intended Diſcourſe, and ſhall only Advertiſe, That theſe Tables are not Printed with the uſual Care of the *Imprimerie Royale à Paris*, That the *Tabula Revolutionum primi Satellitis Jovis in Annis* 100, *pag.* 13 & *ſeq.* is faulty in theſe Years, 16, 39, 55, 98 & 99; as is alſo the *Epocha* for the Year 1700, *pag.* 99. where *pro Num.* I. 1853 *lege* 1873, and *pro Num.* II. 1004, *lege* 110,4: And that the Number of Revolutions of the Second *Satellite* in 100 Years, *pag.* 60, 61; of the Third, *pag.* 76, 77; and of the Fourth, *pag.* 90, 91, are by a groſs miſtake of the Calculator, all falſe and erroneous, and muſt be amended by whoſoever would uſe them. Which yet ought not in the leaſt to be attributed to the Excellent Author, but rather to the Negligence of thoſe employed by him. The Reader hereof is deſired to amend theſe following *Errata*, which were diſcovered when it was too late.

ERRATA. *Pag.* 238. *lin.* 24. *pro* $5^{o.}\ 30'$. *leg.* $5^{o.}\ 31'.\ 40''$. *lin.* 25. *pro* $8^{o.}\ 26'\frac{1}{4}$. *leg.* $8^{o.}\ 28'\frac{1}{2}$.

III. *A Paper about Magnetiſm, or concerning the changing and fixing the Polarity of a Piece of Iron.* By Mr. J. C.

October 14th. 1694.

SIR,

HAving but little Matter from abroad, I will here give you ſomething of my own: Being a Breviate of ſome Experiments of the *Loadſtone*, or rather of *Magnetiſm*, which I lately made.

'Tis known that a Rod of Iron held Perpendicular to the Horizon, or inclining, the lower end is its North Pole, or attracts the South end of a Magnetick Needle; and that the ſame end held upwards becomes a South Pole, *ſc.* attracts the North end of a Needle, and repels the South end. The South I call a mutable Pole, which may be North or South, according as you hold it. I call a Fixt Pole that which does not change however you hold it, particularly that is a fixt North Pole, which though held upwards, attracts the Needles South end, and repells the North end: And that is a fixt South Pole, which held downwards attracts the Needles North end, and repells the South end. 'Tis known that the Magnet does make ſuch fixt Poles. But to do it without the Magnet, is what I here chiefly conſider.

1. The Species of the Pole, whether North or South, may be found by paſſing the Iron Rod through Cork or Wood, and then leaving it to ſwim on Water, it will turn to its proper Pole. But this way is not nice, but in ſome caſes ſo ſlow, that you would think it to be at reſt when 'tis in motion towards its Pole. A better way to try for Inſtance a North Pole, is to hold the Iron

Perpendicular to the Horizon, and to try whether, being held under the North end of the Needle, it attracts it. But a yet better way is to try whether the upper end of the Rod attracts the South end of the Needle, for Attraction is more ſenſible than Expulſion.

2. A fixt North Pole may be made with all the ways and Rods that you can make a fixt South Pole, but not *vice verſa*; for there are many caſes wherein you can make a fixt North Pole, but not a fixt South Pole; and whatever way you get a fixt South Pole, 'tis weaker than a fixt North Pole made the ſame way. Applying a Needle to an erect Bar, beginning at the top, and ſo down, the Needle turns not at the middle, but nearer. Of ſome Rods you cannot make a fixt South primarily, yet you may conſequentially; ſo you may make one end a North Pole, and then the other end of thoſe Rods may without more to do become a fixt South Pole: But this does not always hold, for the one may be a fixt North Pole, the other may be a Mutable Pole.

3. Fire deſtroys all fixt Poles, *ſc.* whether made by the Magnet, or otherways; but it increaſes, or rather leſs hinders that Magnetiſm which proceeds from the Earth: *Sc.* a Wire or Rod of Iron heated at one end, that end is a Mutable Pole, but more vigorous while hot than if cold, *ſc.* the ignited end held downwards, will attract the ſaid end of the Needle more vigorous, than if cold; and ſo if held upwards, it more attracts the North end. The vigour of Mutable Poles is more in great than little Rods, but 'tis otherways in fixt Poles.

4. Heat the end of a Rod of Iron red-hot (or heat all the Rod) and cool that ignited end Northward, it will be a (fixt) North Pole; if cooled South, it becomes a (fixt) South Pole. This ſay *Gilbert* and others from Experience. But I ſay, this holds but in ſome caſes; *ſc.* if the Rod is ſhort, you cannot make a fixt Pole that way: Take a round Wyre whoſe Diameter is $\frac{1}{5}$

Inch, and length 10 Inches, you cannot produce a fixt Pole by Ignition; but if this Wyre were longer, as ſuppoſe 30 Inches long, or never ſo much longer, 'tis capable of a fixt Pole by Ignition: Again, take a round Rod 30 Inches long, and one Inch diameter, this Rod is not capable of a fixt Pole at that length, though the leſſer was capable at that length. And ſo my Experiments give me reaſon to think that there is no Rod or Bar of Iron ever ſo thick, but which if it had length enough, would be capable of a fixt Pole by bare Ignition, for of that I only ſpeak in this Paragraph; and there is no Rod ever ſo ſhort, but which if you make it ſufficiently thin, is capable of a fixt Pole. So when in a Rod I could not obtain a fixt Pole at 21 Inches length in that thickneſs, I could by making the Rod thinner produce a fixt Pole even in the length of one Inch and leſs, and the Pole ſhould be of which kind I pleaſed. The *terminus*, or neceſſary length for every thickneſs increaſes more than you would be apt to think.

5. Heat a Rod or its end red-hot, and throughly cool this end downwards, or towards the *Nadir*, it will have ſomewhat more Magnetiſm than if cool'd Horizontally towards the North. But the better way is to cool it a little inclining towards the North. I cannot find that Multiplicity of Ignitions does produce more Magnetiſm than one good Ignition; but it muſt be throughly ignited. Nor can I find by many Experiments that quenching in Water ſignifies to the producing or hindering Magnetiſm, but many Ignitions may accidentally promote it by purifying the Iron.

6. Dr. *Power* ſays, That if we hold a Rod Northward, and hammer in that poſition the North end, that will become a North Pole, *i. e.* a fixt North Pole; contrarily if you hammer the South end. Now this is true only in ſome caſes, *ſc.* it holds in Rods only of a certain

length: *Sc.* I ſay here again, as before of Ignitions, that of round Bars of the ſame Diameter there is required a certain length, under which a fixt Pole can't be produced by hammering, but of any length more than that certain length, you may make it; and then if you take a Bar ſhorter than that length of which you can't make a fixt Pole, while you keep that Diameter; if you take a Rod of the ſame length but leſs Diameter, you may by blows produce a fixt Pole: Or if you only beat that thicker Bar thinner, you may produce a fixt Pole, tho' the Rod is never ſo ſhort, provided you beat it thin enough.

7. What is ſaid of Hammering, is to be underſtood of Filing, Grinding, Drilling, Sawing: yea, a hard Rubbing, yea, a ſoft Rubbing, provided 'tis long, will produce fixt Poles; the more heavy the blows are, *cæteris paribus*, the Magnetiſm is more: I ſay, *cæteris paribus*, as when the blows be not ſo heavy in either caſe as to flat, for flatting the Iron produces more Magnetiſm, though other things don't vary. A few hard blows will produce as much Magnetiſm as many, as to ſenſe, as if you give never ſo many blows; yet a ſoft blow, may produce but little Magnetiſm. The utmoſt Magnetiſm that I could produce in ordinary Rods this way, did not exceed that which an ordinary Loadſtone would have infuſed.

8. Beating many Rods Northward, whoſe lengths I knew ſufficient, I never failed of producing a fixt North Pole; but hammering the ſame or like Rods Southward, I found that I could not produce a fixt South Pole, only a mutable Pole; nay, hammering one full South, I produced a fixed North Pole: Then I thought the reaſon might be, that the hammered South end on the Anvil was a little lower than the end which I held in my hand. Then I held the end higher, and South upward, and

ſo hammering it South upwards, I never failed producing fixt South Poles in proper Rods.

9. Old Drills and Punches are fixt North Poles, becauſe almoſt conſtantly uſed downwards, but new Drills are either Mutable Poles,or weak North Poles; when I ſay a new Drill,I don't mean one made on the ſpot, for that is probably a North Pole, becauſe quencht downwards in Water; but then ſuch Polarity made by bare Ignition is a weak Pole, and ſoon decays, and turns to a Mutable Pole: But I mean a Drill, which though never or little uſed, yet has been made ſome Days or Weeks; Drill with this Southward Horizontally, and 'tis a chance if you produce a fixt South Pole, but much leſs if you Drill South downwards,but if you Drill South upwards, you may make it a fixt South Pole.

10. The ſtronger the Polarity is, the longer it will laſt; a weak fixt Pole may degenerate into a Mutable Pole in a days time; yea, I have known it in a few Minutes, while expoſed to the Air, and held in a poſition contrary to its Pole: On the contrary we find Needles toucht with good Loadſtones hold that Vertue a great while, if kept from Air, and in a Meridian ſite.

11. The Loadſtone it ſelf will not make a fixt Pole of any Iron, only it muſt have a proper length if 'tis thick; or if 'tis ſhort, it muſt have a ſufficient thinneſs: So, ordinary or weak Loadſtones cannot fix a Pole in a thick ſhort Key,which yet they will do in a little Key. So in a ſhort thick Iron tapering,a Loadſtone may fix a Pole in the little end, when it cannot in the great end.

12. When Ignition, Hammering, or a Loadſtone cannot make fixt Poles, it muſt not be thought that it can do abſolutely nothing on ſuch Rods, for even then it may be found that there's an Effect of Magnetiſm in them diſcernable enough otherways, though not enough to make fixt Poles.

13. When you have the due length for making a fixt Pole, you will find the making one a fixt North, will conſequently render the other a fixt South Pole; but if keeping the ſame Diameter of this Rod, you increaſe its length enough, the making one end a fixt North Pole, will not neceſſarily make the other a fixt South Pole, but leave it a Mutable Pole. So if you by a like Primary Operation make the ſecond end a fixt Pole, the firſt end will loſe its fixity, and become mutable. I ſay, there's a certain length ſuited to every thickneſs of Iron, to leave one end mutable, while the other is fixt, and the thicker the Iron is, the greater is this length.

14. If you further increaſe the length of the ſame Rod, you will attain ſuch length, that the oftner you have fixed a Pole on one end, and then go to fix the other end, the fixity of the firſt will not be deſtroyed, and that end become mutable as before, but the fixity of the firſt end will remain, and ſo you make both ends two fixt North Poles, or two fixt South Poles. I ſay, the ſhorteſt length (for there's no *terminus* of the greateſt length) for this is more in thick than in thin Iron.

15. The aforeſaid lengths are leſs, according to the ſtrength of Magnetiſm, *ſc.* Ignition requires a greater length than when a Rod is actuated by a Loadſtone; and a Rod touched with a ſtrong Loadſtone requires leſs length than one toucht with a weak one.

I have ſome Years ſince read *Kircher*, *Gilbert*, and Dr. *Power*, who mention nothing of this, nor any other Author as far as I remember; I am ſure it was new to me. I hear Dr. *Plot* has a Manuſcript of Monſieur *Chamar*'s Magnetical Experiments; alſo there's a *French* Author publiſht not many Years ſince on this Subject: Alſo Dr. *Wallis* thinks the *Royal Society* has made Experiments of Magnetiſm. I have ſeen neither of theſe, perhaps they have done this Subject to much better purpoſe than your &c.

IV. *An Account of a Lamb ſuckled by a Weather Sheep for ſeveral Months after the Death of the Ewe. Communicated by Mr.* Tho. Kirke *from* Cookridge *in* Yorkſhire.

Cookridge, Septemb. 28. 1694.

Honoured Sir,

THE other day I dined with a Neighbouring Gentleman (Sir *William Lowther*) where I met with ſomething that to us ſeemed Remarkable: He had this Year an Ewe that had two Lambs, and ſhe dying, left them young to ſhift for themſelves; one of them was entertained by a Weather Sheep (*aries caſtratus*) amongſt above an Hundred other Sheep: The Lamb ſuckt the Weather, and brought him to Milk, and was maintained by him all this Summer, till about a Month ago that he was weaned. The Weather was brought up to us, and we ſaw his Udder, each ſide whereof was about the bigneſs of a Hens-Egg, and he had two conſiderable Teats. I ſaw Milk ſpurted out of them, to a yard or two's diſtance, notwithſtanding the Lamb had been taken from him ſo long, *&c.*

V. *A Second Letter concerning the ſame.*

Cookridge, Novemb. 2$^{d.}$ 1694.

Honoured Sir,

YEſterday I ſaw the Weather again, his Udder is much fallen, each ſide being now about the bigneſs of a Wallnut; there is Milk ſtill in it, enough to ſtream out above half a yard. There is no Tokens at all of an *Hermaphrodite* in him. I compared him with another Weather, who had Teats or Paps like him, and differed in nothing but the Udder. It ſeems the Ewe dyed upon ſhearing, being over-heated, and lying on the Ground without her Fleece, took Cold, and dyed preſently. The Lamb, they ſay, was about five Weeks old, ſo 'tis likely might feed partly upon Graſs, as I ſuppoſe other Lambs of the like Age do, notwithſtanding what they ſuck from their Dams, &c.

VI. An Account of Books.

1. *Reflections upon Ancient and Modern Learning. By* W. Wotton, *B. D. R. S. S. and Chaplain to the Right Honourable the Earl of* Nottingham. London, *Printed for* Peter Buck, *at the Sign of the* Temple *near the* Inner-Temple-Gate, Fleetſtreet. *In Octavo.* 1694.

THE Deſign of this Book, as the Author ſays himſelf in his Preface, is to ſtate the Boundaries of Ancient and Modern Learning, that ſo Men may know which to recur to as their Guides, if they would be Maſters of any particular part of Knowledge; it being in his Opinion a very pernicious thing, and very deſtructive to the Increaſe of Solid Learning, to reſt upon the Ancients where the Moderns have ſucceeded them; or to ſtudy Second-hand Books upon Subjects which have been borrowed from the Ancients; eſpecially ſince he pretends to prove that in ſome things either of them have ſo far out-done the other, that it cannot be a matter of Diſpute amongſt able Judges, to which ſide one ought to give the preference. Hereupon, in order to make out this Propoſition, he divides his Diſcourſe into three general Parts. (1.) He enquires what Sciences the Ancients may have been ſuppoſed to bring to Perfection, chiefly becauſe they got the ſtart by being born firſt. (2.) Wherein the Ancients have excelled the Moderns, and why they may have been ſuppoſed to have been ſo. (3.) Wherein the Moderns have out-done the Ancients. Under the firſt Head he reckons *Ethicks* and *Politicks*; under the ſecond *Oratory* and *Poeſie*; all the other parts of Learning have either been improved by the Moderns, or the Queſtion cannot well be decided. (*Chap* 1.)

He begins with *Ethicks* and *Politicks*. Here he ſuppoſes that the Ancients might have been as well skilled as the Moderns, ſince nothing but Experience is requiſite to underſtand thoſe things, which the Ancient *Ægyptians*, *Greeks*, and *Romans* could not miſs of, who lived in formed Societies for ſo many Ages; accordingly he Inſtances in *Ariſtotle*'s Ethicks to *Nicomachus*, *Xenophon*'s *Cyrus*, *Theophraſtus*'s Characters, *Tully*'s Offices, and ſeveral other Ancient Books, as Maſter-pieces in their reſpective kinds, of Moral and Political Knowledge. Yet all this, according to our Author, requires no particular ſtrength of Genius to compleat it, ſince the *Chineſes* and *Peruvians* ſeem to have done as great things towards the raiſing of wiſe and laſting Governments, which muſt be the effects of extraordinary Skill in this part of Knowledge, as any of thoſe Nations which are ſo much commended for Civil Prudence. (*Chap.* 2.)

Next he goes to *Oratory* and *Poeſie.* He ſuppoſes that *Virgil*, and *Homer*, and *Horace*, and *Terence* may have been better Poets than any of the Moderns in their ſeveral ways; and that *Demoſthenes* and *Cicero* have not been equalled by Modern Orators. He thinks that the Excellency of the *Greek* Poetry might at firſt proceed from the manageableneſs of the *Greek* Language, and afterwards from the great Veneration which was paid to their Poets, which made very many put in for the Prize, of whom ſome few, one or two at leaſt of a ſort, arrived to ſo great an Excellency, that others have deſpaired to equal them, ſince Imitation in thoſe things, not only neauſeates but clogs Mens Parts. The Conſtitution of their Governments, which were chiefly Republican, obliged them likewiſe to ſtudy Oratory, as a likely way to riſe in their ſeveral States, for which Reaſon, as amongſt many Rivals, ſome grew very Excellent, ſo when their Liberty was taken away by the *Macedonians*, their Eloquence decayed along with it. The ſame Reaſons may in his Opinion be aſſigned for the Riſe and Decay of the *Roman* Eloquence and Poetry. Though in ſome ſort of Compoſures, Hiſtories for Example, where Oratory has but a Secondary ſhare, he believes that the Moderns may have equalled the Ancients; and he thinks that the *Memoirs* of *Philip Comines*, and F. *Paul*'s Hiſtory of the Council of *Trent*, may be ſet againſt any of the Hiſtories of the Ancients with which it can be proper to compare them. (*Chap.* 3.)

This leads him to Examine Monſieur *Perrault*'s Hypotheſis, who aſſerts that Modern Eloquence, and Modern Poetry are preferrable to the Ancient: There he goes through the ſeveral Reaſons which Monſieur *Perrault* brings to eſtabliſh his Hypotheſis, and concludes that they are inſufficient; particularly he ſeems to think it very hard Meaſure, that the Tranſlations of the Pieces of Eloquence of the Ancients ſhould be ſet againſt Original Pieces of the Moderns, ſince every Language has Beauties of its own, which can never be reached in another, though never ſo exact and elegant. (*Chap.* 4.)

In the Fifth Chapter he conſiders *Ancient* and *Modern Grammar*, as it comes under the Cognizance of Criticks, or of Philoſophers. For the firſt, which he calls Mechanical Grammar, he ſuppoſes that ſome Moderns have underſtood the Analogy of the *Greek* and *Latin* as well as any of the Ancients; and he thinks that Modern Tongues have been as critically ſcanned as any of the Ancient ones, eſpecially *Engliſh* and *French*, which he particularly inſtances in. For Philoſophical Grammar, he recommends Biſhop *Wilkins*'s *Eſſay towards a Real Character and Philoſophical Language*, and the Third Book of Mr. *Lock*'s *Eſſay of Human Underſtanding*, as Original Pieces that Antiquity has nothing to ſet againſt. (*Chap.* 5.)

When he comes to compare *Ancient* and *Modern Architecture*, *Statuary*, and *Painting*, he abridges what Monſieur *Perrault* had ſaid already upon the ſame Subjects in his *Parallel of the Ancients and Moderns*, wherein he gives the Moderns every where the Preference, without interpoſing his own Judgment. (*Chap.* 6.)

After this he comes to enquire into *Ancient and Modern Philoſophy and Mathematicks*; but before he ſpeaks particularly of them, he examines Sir *W. T*'s. Hypotheſis of the Hiſtory of Learning ſtep by ſtep, againſt whoſe *Eſſay upon Ancient and Modern Learning*, a great part of his Book ſeems to be levelled. Sir *William Temple* had exceedingly commended the Learning of *Pythagoras* and the Ancient Sages of *Greece*, as alſo that of the old *Ægyptians*, *Chaldeans*, *Arabs*, *Indians*, and *Chineſes*. Our Author thinks that *Pythagoras*'s chief

Excellency lay in Political Knowledge; and that though he was a better Mathematician and Philoſopher than any Man of that Time, yet ſince he is commended chiefly for finding the XLVII Propoſition of the Firſt Book of *Euclid*, his Skill in thoſe matters was, comparatively ſpeaking, but very indifferent, which he alſo affirms of the Ancient Sages. (*Chap.* 7, 8.)

From them he goes to the *Egyptians*, of whom he obſerves, That more may be challenged from them, than from other Nations, becauſe their pretences to exactneſs in Recording Inventions and Traditions have been more conſiderable. Yet he thinks that their Hiſtory could not be extraordinary, ſince both the Time when the Pyramids were built, and that when their great Hero *Seſoſtris* lived could never be determined by the Ancienteſt Writers now extant: That all the great Ancient Inventions in Geometry, though its Original be owing to them, are conveyed to us by *Greeks* as their own Inventions: That their Medicine was wholly built upon Aſtrological or Magical grounds: That their Pretences to the Philoſophers Stone, ſeem to have been Father'd upon them by later Alchemiſts: That their skill in Anatomy was ſo ſmall, that they believed that the Heart increaſed Annually two Drachms in weight till Men were 50 Years old, and afterwards decreaſed as gradually; for which reaſon, according to them, no Man could live above 100 Years: That with all their boaſted Curioſity, they ſeem never to have failed 200 Miles down the *Nile* into *Æthiopia*; ſince till about *Plato*'s time, they could not give a clear Solution of the Annual Inundations of that wonderful River: And in ſhort, That their greateſt Skill lay in making Wiſe and Prudent Laws, which were worth going ſo far as the *Greeks* went to fetch them. (*Chap.* 9, 10.)

He thinks that the *Chaldean* Learning was not ſo excellent as the *Ægyptian*; that the *Aſſyrian* Hiſtory, which we have from the *Chaldeans*, contradicts the *Jewiſh*: That the *Chaldean* Aſtrology was downright Knavery: And that for other things, had they been very conſiderable, there would have been more Memorials of them preſerved. The *Arabian* Learning is, according to him, all in a manner owing to the *Greeks*, ſo that its Antiquity or Extent cannot here be alledged. (*Chap.* 11.)

He believes the *Chineſe* Natural Knowledge to be very inconſiderable, and their Speculative Skill in Medicine entirely Phantaſtical: To prove which he produces a long Citation out of an Old *Chineſe* Book, called, *Nuy-Kim*, Printed by *Cleyer* in his *Specimens of Chineſe Phyſick.* (*Chap.* 12.)

He divides the *Grecian* Learning into Four Parts; *Logick*, *Metaphyſicks*, *Mathematicks*, and *Phyſicks*. *Logick*, as it is the Art of Diſputation and Method, is in his Opinion, to be aſcribed to the Ancients; as it is the Art of Invention it is more owing to the Moderns, ſince the Methods of Invention which the Ancients made uſe of, ſeem to be entirely loſt. Here he commends *Des Cartes's Meditations*, *Tſchirnhaus's Medicina Mentis*, and Mr. *Lock's Eſſay of Humane Underſtanding*. In *Metaphyſicks* he thinks the Writings of *Des Cartes* and his Followers may be ſet againſt all that the *Platoniſts* ſay upon thoſe Subjects, though they of all the Ancients Diſcourſe the moſt upon Spirits and Incorporeal Subſtances. (*Chap.* 13.)

When he ſpeaks of *Ancient and Modern Mathematicks*, he produces a Diſcourſe of that Excellent Geometer, Mr. *John Craig*, who endeavours to prove that Modern Geometry is of infinitely larger extent than the Ancient; and that it has been enlarged by Methods in a good meaſure unknown to, or at leaſt, not comparatively cultivated by the Ancients, which are, Algebra and the Method of Indiviſibles; the particular Advantages of the former of which in improving Arithmetick and Geometry he does at large inſiſt upon. (*Chap.* 14.)

Afterwards when he comes to *Phyſicks*, our Author obſerves that there are ſeveral Inſtruments and Arts, which are neceſſary Tools to a good Philoſopher, that have been either invented, or very much improved by Moderns, for want of which it was impoſſible for the Ancients to underſtand Nature ſo well as it has ſince been underſtood. Among Inſtruments wholly Modern he reckons, (1.) *Printing*, which is uſeful to all Learned Men alike. (2.) *Engraving upon Wood and Copper*, which is peculiarly uſeful to all Writers of Natural Hiſtory and Mathematicks. (3.) *Teleſcopes*, firſt invented by *Zacharias Joannides*, a Spectacle-Maker of *Middleburgh* about the Year 1590, whereby the Heavens have become more acceſſible to Modern Aſtronomers than they were to the Ancients. (4.) *Microſcopes*, the Invention of the ſame *Joannides*, of infinite uſe in diſcovering the Texture of Minute Bodies. (5.) *Baroſcopes*, by which the Comparative Gravitation of Air upon Terreſtrial Bodies may be found out. (6.) *Thermometers* to adjuſt the variations of Heat and Cold. (7.) *Air-Pumps*, very uſeful in diſcovering many hidden Properties of the Air. (8.) *Pendulum Clocks*, neceſſary for Aſtronomers in Meaſuring ſmall Subdiviſions of Time, when they make their Obſervations. (*Chap.* 15.)

Amongſt Preliminary Arts he reckons *Chymiſtry* and *Anatomy*: By *Chymiſtry* he underſtands the Art of Separating Bodies by Fire; and he obſerves that though the Ancients could refine Metals from their Droſs to a good degree, yet for want of *Aqua Fortis* they could not part them from one another ſo well as they can at preſent. He ſays, Chymiſtry, properly ſo called, is moſtly owing to the *Arabs*, and that the *Greeks* knew ſcarce any thing at all of it; but yet that the uſe of Chymical Preparations in Phyſick is almoſt entirely owing to the Phyſicians of this and the laſt Age, ſince the Time of *Paracelſus*. (*Chap.* 16.)

Of *Anatomy* he ſays, That the Ancients Skill in it reached only to thoſe Parts that are diſcoverable by the naked Eye, and even there not ſo far as the Moderns have carry'd it in any one Particular: That the Extent of the Ancients Knowledge in that matter may be certainly known from the Anatomical Diſcourſes of *Galen*: That if we deſcend to Particulars, the Anatomy of the Brain was not known to any tolerable degree before *Malpighius* and *Willis*: That the Ancients knew little of the Texture of the Eye, in compariſon of what may be found in the Writings of Dr. *Briggs*: That the Glands which ſupply it with moiſture, are by no body ſo well deſcribed as by Monſieur *Nuck*: That the Ear, with its inner Cavities, was little known before Monſieur *Du Verney*: That the knowledge of the Texture of the Tongue is owing to *Malpighius*; of the Glands of the Mouth, Jaws, and Neck, to *Wharton*, *Steno*, and *Nuck*; and of the Lungs, to *Malpighius*: That the Primary uſe of the Lungs was wholly unknown to the Ancients, who had no Notion of the Circulation of the Blood; ſince all that can be collected from the Writings of *Hippocrates*, *Plato*, and *Ariſtotle*, is, that the Blood had a conſtant recurrent Motion through the Body, which they could not diſtinctly deſcribe: That this Motion through the Veins to the right Ventricle of the Heart, thence through the Lungs into the left, and ſo through the Arteries over the whole Body till it meets again with the Veins, firſt called by *Cæſalpinus* the Circulation of the Blood, was firſt diſcovered by *Servetus*, then purſued ſomewhat further by *Columbus* and *Cæſalpinus*, and at laſt made perfectly Intelligible by Dr. *Harvey*, whoſe Diſcoveries were lately made compleat by Monſ. *Leuwenhoek*: That the Texture of the Heart was firſt diſcovered by Dr. *Lower*, of the Coats of the Stomack by Dr. *Willis*, of the Fibres of the Inteſtines by Dr. *Cole*, of the Chyliferous Veſſels by *Aſſellius* and

Pecquet, of the Lacteal Veſſels in Women by Monſieur *Nuck*, and of the Liver by *Malpighius*: That the *Ductus Pancreaticus* was firſt diſcovered by *Wirtſungus*, and the Spleen and the Reins found to be Glandulous Bodies by *Malpighius*: That the *Lympha* and its *Ducts* were never thought of, till they were diſcovered by *Bartholin*, *Rudbeck*, and *Jolliffe*: That Dr. *Havers* found out the Mucilage in the Joynts, with the Glands which preſerve it: And laſtly, That the Anatomy of Bruits has been as carefully examined as that of Men, of which he gives ſeveral Inſtances. (*Chap.* 17, 18, 19.)

In Treating of *Philoſophy*, he begins with Natural Hiſtory, and with that of Elementary Bodies and Minerals as the ſimpleſt. He obſerves that the Ancients knew little of the Nature of Air; that though *Ariſtotle* believed it to gravitate, yet his Diſciples ſo little underſtood him, that they aſſerted the quite contrary; that the Doctrine of its Spring is owing to our truly Noble Countryman Mr. *Boyle*, whoſe Hiſtories of the moſt conſpicuous qualities of Terreſtrial Bodies have much enlarged that part of Natural Hiſtory. In his Account of Minerals he inſtances in the Loadſtone, whoſe Nobleſt Properties were Anciently unknown; and he enlarges upon their uſe, with the increaſe of Wealth and Knowledge, which thereby have accrued to theſe *European* Nations, in theſe two laſt Ages. (*Chap.* 20.)

Of the *Natural Hiſtory of Plants* he Obſerves, that all Ancient Deſcriptions are confuſed and lame, and in number very deficient: That nothing which they did can be compared with *Gerhard*'s, *Parkinſon*'s, and *Bauhines* Herbals, much leſs with Mr. *Ray*'s, who firſt drew up a Methodical Hiſtory of all the Plants yet known. (*Chap.* 21.)

Of *Inſects* he Obſerves, That the Ancients only medled with the moſt Remarkable ſorts, and there rarely took notice of any but the moſt conſpicuous things:

So that all which *Malpighius* and *Rhedi* ſay concerning their Generation, all that is in the Writings of *Goedartius* and *Swammerdam* concerning the Time and Nature of their Tranſmutations, may be looked upon as wholly new. And as for *Hiſtories of larger Animals*, he pretends that *Willoughby*'s Hiſtories of Birds and Fiſhes, *Ray*'s *Synopſis* of *Quadrupeds*, beſides a great many Modern Diſcourſes upon particular Animals, are without compariſon better than the Hiſtories of *Ariſtotle*, *Ælian*, or *Pliny*. (*Chap.* 22.)

Afterwards he inſerts a Diſcourſe written by that moſt excellent Aſtronomer Mr. *Halley*, concerning Ancient and Modern *Aſtronomy* and *Opticks*; who ſays, that the *Ægyptian* and *Chaldean* Aſtronomy was little worth in it ſelf, and the *Greek* Aſtronomy not much better, if compared with the Modern: That *Ptolemy*'s Hypotheſis of the Planetary Motions cannot be ſet againſt *Kepler*'s and *Newton*'s; nor *Hipparchus*'s Catalogue of the Fixt Stars againſt *Tycho Brahe*'s and *Herelius*'s: That the Ancients could know but little of *Opticks*, ſince they were ſo meanly skilled in Perſpective; and of *Dioptricks*, they were wholly ignorant, ſince they had no Notion of the Properties of Refraction, which *Des Cartes* firſt reduced to a Science, (*Chap.* 23.)

Of *Muſick* he determines nothing poſitively, but ſeems to think that ſince the grounds of Muſick have always been the ſame, and that the Moderns uſe more Gradations of Half-Notes and Quarter-Notes than the Ancients; and that the Symphonys of the Ancients were only Conſorts of ſeveral Voices and Inſtruments to the ſame Part; that Modern Muſick, conſidered as Art, is perfecter than the Ancient, which was ſo much extolled by thoſe that heard it, becauſe it was the moſt excellent they had ever heard, and ſo had a right to the greateſt Commendations which they could give it. (*Chap.* 24.)

Of *Medicks* alſo he determines nothing, as to Ancient and Modern Methods of Practice, only allows *Hippocrates* to have been a very great Genius, perhaps not equalled by any Phyſician that have come ſince: Yet conſidering how much Botanicks, Chymiſtry, and Anatomy have been enlarged, he thinks that Modern Theories of Diſeaſes are much more valuable, than Ancient ones, for want of thoſe helps, could poſſibly be. (*Chap.* 25.)

In ſpeaking to *Ancient and Modern Methods of Philoſophizing*, he gives the preference to the latter; becauſe no Principles of Nature are there allowed, but what are in themſelves intelligible; and the buſineſs of forming Parties is now in a manner out of doors, and Mathematical Reaſonings are conſtantly urged as valid ways of Proof, in all Phyſical Enquiries where they can be brought in: Hereupon he takes occaſion to enlarge upon the Deſign of the ROYAL SOCIETY, and hints at the great things which its Members have effected towards the compleating of Phyſical Knowledge. (*Ch.* 26.)

Having gone through thoſe Sciences which lye equally open to Men of all Ages to make Diſcoveries in, he goes on to thoſe which have their whole Foundation in Antiquity, wherein by conſequence the Moderns ſeem to have no Pretence to a Compariſon; ſuch as *Philology* and *Divinity*. Yet he ſays, that if we conſider how much Printing has altered the ſtate of Learning, how wide a thing Antiquity is in all its compaſs, how many things rarely meeting in one Man, are requiſite to make a Man a through Critick; we ought to conclude, that though every Age of Antiquity knew it ſelf better than we can pretend to know it, yet in the groſs, the *Scaligers*, the *Voſſius's*, the *Uſhers*, the *Seldens*, the *Bocharts*, and ſuch Modern Philologers have had a greater extent of Ancient Learning, than any ſingle Man among the Ancients could poſſibly have. (*Chap.* 27.)

And as to *Divinity* he ſays, That though the Scriptures and the Writings of the Ancient Fathers be the Foundations upon which every Divine ought to build; yet if we conſider that the Text of the Bible it ſelf by a familiar converſation with the Oriental Languages is now better underſtood: That Caſuiſtical Knowledge lies as obvious now as ever it did: That the Art of Preaching is more Methodical, and by conſequence more Inſtructive: That Controverſies have been managed more nicely, and more exactly, we muſt allow Modern Divines to have been the better Workmen, though the Matter which both they and the Ancients have joyntly wrought upon, has been the ſame. (*Chap.* 28.)

His laſt Chapter is employed about Anſwering ſome Reaſons which Sir *W. T.* aſſigns for the decay of Learning; ſuch as, (1.) Diſputes in Religion; which in his Opinion have rather increaſed Knowledge than otherwiſe, ſince the Spirit of Oppoſition, when once raiſed, will ſhew it ſelf in every thing as well as in thoſe matters which firſt gave it Life. (2.) Want of Favour from Great Men, of which, according to him, there is not ſo much Reaſon to complain, conſidering that the *French* King, Q. *Chriſtina*, and ſeveral others whom he there mentions, lived all of them in this Age. (3.) Pedantry; which alſo he pretends to be in a manner quite Baniſht out of the World.

The whole Book ſeems to be deſigned for a Vindication of that ſort of Learning, which it is the intention of the *Royal Society* to promote, for which Reaſon probably he took no Notice that he had the Honour to be a Member of that Body.

2. Horti Malabarici. Pars Decima, Undecima, Duodecima, & Ultima. *With ſome Remarks upon them by* T. R. *M. D. S. R. S.*

NIne Tomes of this great Work being already mentioned in theſe Tranſactions, N°. 145. N°. 198. N°. 200. I will here finiſh the Account of the remaining Volumes.

The Tenth Part contains 94 Plants with their Deſcriptions, Figures, and Uſes, all Natives of the Kingdom of *Malabar*, collected and deſign'd during the Memorable Government of that Excellent Perſon, *The Heer Van Rheed.*

Amongſt theſe are the *Manga-Nari*, an Aromatick Spicy ſort of *Veronica*, given in Fevers and *Vertigo's.*

Schada-veli-Kelangu, or *Aſparagus maximus, aculeatus, Sarmentoſus, radicibus multis fuſi-formibus, Scorzoneræ ſapore*, which makes one of the moſt delicious Diſhes in *India.*

Brami, or *Glaux Portulacæ folio, flore majore diluto cæruleo, albicante colore*; the eating whereof ſwells their Cattel with milk, and clears the Voice more powerfully than our Liquorice.

Two *Kirganeli's*, a-kin to the *Vitis Idæa*, uſed by the *Indians* as a Specifick in Dyſenteries.

Kurundoti or *Ciſtus Indica humilis, Ciceris folio, flore flavo*, of daily uſe in all Convulſive and Nervous caſes.

Katu-Tſietti-Pu or *Ambroſia Orientalis, Artemiſiæ folio odoratiſſimo, floribus flavis*, a moſt excellent Anodyne and Hypnotick.

Ana-Coluppa or, *Ranunculo Affinis Planta Indica, floribus purpureis*, which is ſaid to Cure the Falling-Sickneſs, and to expel alone the virulent Poyſon of that Famous *Indian* Serpent, commonly called *Cobra-Capello.*

Bena-Patſia, a ſort of *Heliotrope* or *Turnſole*, given very ſucceſsfully in the Venomous Bitings of thoſe *Aſiatick* Foxes, vulgarly named by Travellers, *Jakhals*, or *Jacals.*

Kalengi-Ganſiava, or in the *Brachman's* Language *Bangi*, and commonly *Bangue* amongſt us *Europeans*, a true Species of *Hemp* both by the Icon and Deſcription, and very much taken notice of for its Narcotick and Inebriating Faculty, therefore of general uſe in *India* for the promoting of Venery, (for which the *Dutroy*, a ſort of *Stramonium*, is celebrated in that Country) and in ſtopping of Fluxes, but moſt Specifically given in that Endemial Diſeaſe called *Pitao*, a ſort of Jaundiſe, contracted by the frequent drinking of *Arak* or *Rack*, the abuſe of *Betel* and *Fauſel*, and the daily working under a ſcorching Sun.

Naga-Dante, a ſort of *Ricinus* or *Palma Chriſti*, of that violent and ſubtile Purgative Nature, that the very ſmell of the red Seeds will excite the Stomach and Guts into Cathartick Motions. The Leaves externally apply'd drive away Arthritick Symptoms.

Several *Tirtava's* or *Scrophularia's*, one of which is in Flower all the Year, and is conſecrated to the God *Viſtnu*, therefore in high Veneration amongſt the *Brachmans*, none of which are ever obſerved to be without it.

To theſe might be added many beautiful Species of *Chryſanthemum's*, *Amaranthoides*, *Alſine's*, *Rubia's*, *Tithymals*, *Althæa's*, *Conyza's*, *Solanum's*, *Nepeta's*. *Cardiaca's*, a-kin to the *Leonurus* of the *Cape of Good Hope*, *&c.* all deſcribed and figured, with their Uſes, in this Tenth Volume.

Horti Malabarici, Pars Vndecima.

This Eleventh Tome comprehends 65 Plants with their ſtately Icons drawn from the Life. The firſt whereof is the *Kapa-Tſiakka* or *Ananas*, called by our *American* Planters, The *Pine-Apple*; 'twas firſt brought into the *Eaſt* from the *Weſt-Indies*, and grows larger here than in its own Native Soil. Its delicacy and uſe are well known.

Elettari or the common *Cardamum* of our Shops, (of which there are three Species) delineated and deſcribed in all its Parts. It grows plentifully in ſhady moiſt places on the declivities of Hills and in Valleys round about *Cochin* and *Calicut*, impatient of the Beams of the Sun. The Vertues are given at large in moſt Writers of the *Materia Medica*.

Kua or *Zerumbeth* of our Shops, a Species of *Ginger*, agreeing in its uſes with the *Long Zedoary*. 'Tis much doubted whether this was known to the *Arabians*. The Root raſped affords a fine Flour or Powder, much eſteemed by the Natives, who make a Paſte and Pottage out of it.

Tſiana-Kua, or the *Coſtus Arabicus of Dioſcorides*, and of our Shops, delighting in ſhades. Upon bruiſing it ſmells of *Ginger*, but vappid and of little taſte, unleſs when freſh.

Malan-Kua, or the *Zedoary* of our Shops, a ſort of *Colchicum*: The long and round ſeem to be different parts of the ſame Aromatick Root, growing in the muddy places of *Malabar*, *Java*, and other Parts of *India*.

Manja Kua and *Manjella-Kua* are two ſorts of *Curcuma* or *Turmerick*, which flouriſh all over the Eaſt, and are of general and known uſes.

Inſchi vel *Inſchi Kua*, is our *Ginger*, which abounds in ſhady places both in the *Eaſt* and *Weſt Indies*, tho' perhaps tranſplanted at firſt. The freſh Roots upon Diſtillation afford a Volatile Aromatick Oleoſe Salt like *Camphire*, of notable Vertue in many caſes. The Author gives three Species of this Plant.

I will Remark here once for all, that the *Cardamomum majus & minus*, the *Bengala Indorum* (out of which our *Muſlins* are ſaid to be made) the *Coſtus Arabicus*, the *Galingals*, the *Zedoary*, the *Zerumbeth*, *Ginger*, and *Turmerick*, do all agree in the ſame Fructification and Characters of having Tuberoſe Roots, oblong broad Leaves alternately ſet, Tetrapetaloſe deformed Flowers coming out of the Scales of the Leaves, and tricapſular Seed-veſſels, which may clearly be obſerved in comparing their ſeveral *Icons* and *Hiſtories*.

Kurka, called in *Ceylon Juſula*, a ſort of *Glans Terreſtris*, and eaten in the ſame manner. It grows plentifully in Sandy places.

Kodda-Pail, or *Sedum Indicum paluſtre, foliis latiſſimis, criſpis, floribus albicantibus piloſis*, floats on the Water like the *Stratiotes* or *Aloe Paluſtris*, uſed much in Bloody-Fluxes, Coughs, and Lumbago's.

Beſides theſe many more might be enumerated out of this Eleventh Volume, of daily uſe in the *Indian Pharmacopœia*, as ſome *Aloes*, great varieties of the *Ariſarum*, the *Dracunculus* or *Arum Polyphyllum*, many *Nymphæa's*, *Gladioli Paluſtres, Tribulus Aquaticus*, ſeveral ſorts of proud *Lillies*, *Narciſſi*, *Arrow-heads*, Baſtard Species of *Paſſion-Flowers*, abundance of curious *Bindweeds*, *&c.* which make up this Tome.

Horti Malabarici, Pars Duodecima & Ultima.

This Volume concludes the whole Work, the Noble Author dying on Ship-board the laſt Year before *Suratt*, where the *Dutch Eaſt-India Company* have ordered a moſt Magnificent Monument to be erected for this Great *Benefactor*, and *Ornament* of their *Republick*. 'Tis to be wiſh'd that his Papers and Deſigns relating to the reſt of the *Dutch Colonies* in *Aſia* and *Africa* (where he has ſome time reſided under Publick Characters) may have fallen into Generous Hands, that will not ſuffer any part of the *Creation* to be abſconded from Mankind, nor the Works of Great Men to lye buried in Oblivion, or deſtroyed by Vermine.

This laſt Tome contains 79 *Icons* together with Deſcriptions, and a general *Index* to the whole Work. It begins with ſeveral beautiful *Orobanche's* or Abortive *Orchi's* growing like *Miſſeltoe* upon Trees, uſed by the *Indians* in Convulſive and Feveriſh caſes.

The Woods in theſe Climates muſt afford pleaſant Proſpects, the Trees being loaded with variety of Herbs either climbing to the tops of them, or ſhooting out of their Trunks and Branches, of which this Volume gives many Species, called properly *Epidendra*, and *Anadendra.*

As the *Maravara's*, an Arboreſcent *Aloe*, called ſo from its Vegetation out of Trees; many Scandent *Ferns*, *Harts-tongues*, *Polypodies*, &c. of which ſome are Spinoſe, and ſerve for Fences to their Gardens and Fields.

Eneadi-Kourengo, a ſort of large *Club Moſs* putting forth of the *Jack-Trees* and *Mango's*. The *Chriſtians* of St. *Thomas* call it *Flagellum S. Thomæ*, and the *Portugueſe Couda de S^to^ Franciſco*, to which they aſcribe many wonderful Vertues. This ſeems to be deſcribed by *Breynius*, under the name of *Selago Indiæ Orientalis,ſive Phlegmaria admirabilis Ceylanica.*

Kalpanna-Maravara, a fine ſort of *Adiantum* or *Maidenhair*, ſprouting upon the Trees in ſtony ſhady places, uſed by the *Indians* in Hectick,Pthtiſick,and Aſthmatick caſes.

To theſe I might add great variety of elegant *Ferns* deſcribed and figured in this laſt Part, but they will be beſt known by conſulting their lively *Pictures*. Theſe with many other different Herbs ſpreading and running upon the Trees choak and venom them. Of the *Climbing Ferns* the *Weſt-Indies* afford many *Species*.

The *Author* gives here ſome new kinds of *Indian Reeds*, *Ruſhes*, *Graſſes*, *Moſſes*, &c. for which the Work may be conſulted; only it may be noted here, that the *Natives* are better acquainted with the uſes of all their *Simples* than the *European Nations* are with theirs, having indeed more of pure Inſtinct and undebauched Nature than the *Civiliz'd People* can pretend to.

Here ends the Admirable *Product* of the *Heer Van Rheed*; whoſe Performances in the *Vegetable Hiſtory* may perhaps raiſe up ſome *Succeſſor* to carry on the like in the *Animal* and *Foſſil*, which ſeem to lye uncultivated, and reſerved for a *Second Rheed*. Beſides theſe, another ſort of *Hiſtory* would become the Greateſt Men that reſide in either *India*, I mean that of the *Arts*, and *Mechanicks* practiſed by the *Natives*, or by *Strangers*, of equal Advantage to Mankind with the *Natural*, both depending on each other.